

BY DESIGN

A brief history of the Public Works Department Ministry of Works 1870—1970

Rosslyn J. Noonan



First published 1975

© Crown copyright

FRONTISPIECE

Railway construction workers' dwellings near Ohakune in 1908. Conditions were raw and candles or kerosene lamps the only lighting. Firewood cut from the bush stands in heaps. In the foreground men carry four-gallon kerosene tins to the nearest creek. A woman and child are seen near the doorway of probably married quarters. The man on her right may be recovering from an injury. The tent has a corrugated iron chimney and this type of accommodation would be occupied for several years.

Auckland Weekly News, 1908

To the staff and employees of M.O.W.

May they learn from the past as they plan for the future.

TABLE OF CONTENTS

CHAPTER		PAGE
1	<i>The Genesis</i> Conditions Existing—First Arrivals—Needs—Early Roads—Provincial Developments—Vogel	1
2	<i>Establishing the Department</i> .. 1870–1876 Vogel's Proposals—Reactions—The Act—The Depart- ment is Established—Organisation—Staff—Resident Minister for Middle Island—Rakaia Bridge—Railways— Blackett's Travels—Fox Ministry Defeated—Board of Control—Reports on Proposed Works—Brogden Con- tracts—Supply of Materials—Staffing Difficulties— Armed Constabulary—Maori Labour—Tauranga- Rotorua Road—Colonial Architect	7
3	<i>Uncertain Future</i> 1877–1889 Additional Work—Staffing Difficulties—Committees and Commissions—Operating Railways Separated— Divided Administration—Difficulties—New Under- Secretary—Department Reunited—Staff Changes— Depression Looms—Civil Service Commission—Outside Pressures—Threatened Abolition—Main Trunk Railway Surveys—Unemployment Relief	36
4	<i>A Going Concern</i> 1890–1920 Diminished but Survives—Some Activities Shed—Dick Seddon Arrives—Permanent Head Dies—Changes Arising—Steady Growth—A Crisis Averted—Co- operative Contracts—Opposition—Fundamental Change —Conditions on Works—Some Major Jobs—Main Trunk Railway Accelerated—Completed—Midland Railway—Arthurs Pass Tunnel—Roading—Hydro- electric Works Start—Architects	63

- 5 *A New Vigour* 1920-1929 99
 Coates and Furkert—Labour Difficulties—Mechanisation
 —Workers Agreement—Unemployment—Planning—
 Political Patronage—Roads—Main Highways Board—
 Traffic Control—Local Bodies Loans—Hydro-electric
 Development — Irrigation — Architects — Contracts —
 Tauranga Railway—Arapuni—Department's Work
 Force—Unemployment Effects
- 6 *The Nadir* 1930-1935 120
 Criticisms—Arapuni—Effects of Depression—National
 Expenditure Commission—Furkert Ceases Duty—
 Depression Activities—Single Men's Camps—Political
 Pressure—Aerodromes—Napier Earthquake—Mohaka
 Cylinders
- 7 *The First Semple Years* 1936-1939 135
 Labour Government—Resurgent Activity—Programme
 —Labour Relations—New Agreement—Mohaka Viaduct
 —Semple's Attitudes—Relations with Staff—Inter-
 ference — Mechanisation — Aerodromes — Irrigation —
 State Highways—Level Crossings—Milford Sound Road
- 8 *The War and its Aftermath* .. 1939-1949 162
 Effects of War—Power Developments—Soil Conservation
 and Rivers Control—Housing—Construction for Armed
 Services—Defence Construction Council—Controls—
 Suspension of Tendering—Commissioner of Defence
 Construction—Alternatives to Tendering—Master
 Schedules—Fletcher Order—Semple Tanks—Accom-
 modation for American Forces—Aerodromes in Fiji—
 Ardmore—Pacific—Ministry of Works—Reorganisation
 of Public Works Department—Planning—Staff Short-
 ages — Housing — Hydro — Roading — Railways —
 Turakina Fordell Tunnels—Aerial Topdressing—End
 of Semple's Reign

9	<i>Problems and Prospects—</i>	
	<i>Public Works</i> 1950–1970	203
	National Government—Contracting—Post-war Shortages, Labour, Materials, Staff—Contractors and Consultants —Role of Ministry—Overseas Contractors—Roxburgh, Manapouri, Rimutaka Tunnel—Cost Increases— Housing—Gordon Wilson—Public Buildings—National Roads Board—Motorways—Heavy Traffic—Roading— Power Developments—Environment—Legal, Water and Soil, Town Planning—Wellington Airport—Public Relations—Epilogue	

Appendices

	PAGE
I The Functions of the PWD/MOW	262
II Some Early Public Works Personalities	279
III Organisation Charts 1874, 1896, 1920, 1937, 1947, 1957, 1970	286
IV Annual Construction Expenditure 1870–71 to 1969–70 ..	294
V Total Construction Expenditure 1870–71 to 1969–70 Pro- portioned by Main Activities	296
VI Railway Mileages Completed in each Decade	298
VII Locations of Main Power Stations	299
VIII Ministers of Public Works/Works	301
IX Permanent Heads of Public Works Department/Ministry of Works	302
X Heads of Engineering Division	303
XI Heads of Administrative Division	304
XII Heads of Architectural Division and of Hydro-electric Branch	305
XIII John Rochfort's Report on Obstructions to Survey ..	306
XIV The Raurimu Spiral on the North Island Main Trunk Railway	312
XV Public Works and Construction Workers Agreement 1921 ..	316

LIST OF ILLUSTRATIONS

Camp life in the New Zealand bush: A scene on the route of the Main Trunk railway	FRONTISPIECE
	PAGE
Princes Street, Dunedin, 1861	2
Otira Gorge, Westland. A temporary footbridge at Wallace's Point, 1876	3
A ferry for animals, passengers, and vehicles, typical of those used before major rivers were bridged	4
Lyttelton end of the tunnel built to take the railway to Christchurch. 1860s	5
Sir Julius Vogel, who took the leading part in setting up the Public Works Department	7
John Blackett, first Assistant Engineer-in-Chief	10
John Carruthers, the first Engineer-in-Chief of the Public Works Department	11
John Davies Ormond, Minister of Public Works, various times 1871 to 1877	12
A convoy traverses the Pigroot on the way to Central Otago	15
A flood in the Otira Gorge	16
The coach crossing the Hope Saddle, between Nelson and Murchison ..	17
Turnbull's gang on road construction in Taranaki	18
Early construction methods with earth wagons ready to go to the tip ..	18
Early railway construction workers with picks, shovels, and wagon ..	18
Near Purakanui in 1875, constructing the railway north of Dunedin ..	18
An excursion train from Invercargill on the way to the opening of the railway to Gore stops near Mataura	20
Maoris working on the road from Galatea to Ahikereu	25
Invercargill Post Office, originally built to serve as departmental offices	32
Government Buildings, Wellington, the "largest wooden structure in the Southern Hemisphere"	32
Parliament Buildings, Wellington, showing the part erected in 1873 and the General Assembly Library	33
The first Upper Manawatu Gorge bridge, completed in 1875	33
W. N. Blair, appointed Engineer-in-Chief and Under-Secretary, May 1890	40
C. Y. O'Connor, Under-Secretary 1883 to 1890	42
Bridge spanning the lower end of the Waimakariri Gorge	49
P. F. M. Burrows, in charge of Architects Branch 1877 to 1884	50
The Supreme Court buildings in Wellington, completed in 1881	51
An early police station, originally one room	53

	PAGE
John Rochfort, engineer who carried out extensive railway location surveys	54
Government Printing Office, Wellington, completed in 1888 ..	56
The Government Buildings at Lyttelton, opened in 1877 ..	56
The northern end of Lambton Quay, Wellington ..	57
Wellington Post Office, first occupied in 1884 ..	57
Widening an early bridle track to form a road ..	58
A "chinaman" or bin to guide spoil into the earth wagons ..	58
Deep ruts have caused the collapse of a buggy ..	58
R. J. Seddon, Minister of Public Works 1891 to 1896 ..	64
H. J. H. Blow, Under-Secretary 1891 to 1916 ..	67
R. W. Holmes, Engineer-in-Chief 1907 to 1920 ..	68
W. S. Short, Under-Secretary 1916 to 1920 ..	69
Sir Wm. Hall-Jones, Minister of Public Works 1896 to 1908 ..	70
Typical of construction camps in the Ohakune-Raurimu area about 1907 ..	76
The Makohine railway viaduct, completed in 1902 ..	79
Railway building through bush country in Taranaki ..	83
Clearing the track for the North Island Main Trunk railway ..	84
A tunnel gang on the Midland railway line ..	85
The start of the Westport-Inangahua railway, 1906 ..	85
A railway construction headquarters at Raurimu in 1907 ..	85
Bogged mail coach near Maungaturoto, 1912 ..	88
The first car to travel by the direct route between Wellington and Auckland ..	88
Metal crusher and elevator in use on road works..	89
A metalling team on Bream Road, Taranaki in 1912 ..	89
Traction engine driving a metal crusher on Waikaremoana road, 1922 ..	89
Operating wheelbarrows over rough ground ..	89
Lake Coleridge power scheme; the pipe lines and power house ..	91
Wanganui Post and Telegraph Office, completed in 1902 ..	92
Ashburton Post and Telegraph Office, opened in 1901 ..	92
New Plymouth Courthouse, completed in 1895 ..	92
Steam navvy loading ballast wagons on Midland railway, 1910 ..	94
The Waiau River ferry in Southland served for many years ..	94
The Farewell Spit lighthouse, erected in 1896, replaced one of timber built in 1870 ..	94
Castlepoint lighthouse, built in 1912 ..	94
General Post Office, Auckland, opened in 1913 ..	95
Public Trust Building, Wellington, completed 1909 ..	96
J. G. Coates, Minister of Public Works, 1920 to 1926 and 1931 to 1933	99

	PAGE
F. W. Furkert, Engineer-in-Chief and Under-Secretary, 1920 to 1932 ..	99
Railway construction in Taranaki	102
A bush tramline with timber rails feeds traffic to the railway ..	103
Excavating a cutting on the Palmerston North railway deviation ..	103
Relaxation in a survey camp	104
Construction camp near Kaikoura	105
Snowfall at a survey camp during investigations for Waikaremoana power scheme	105
Base course being laid on the highway between Johnsonville and Tawa	110
Metalling operations on the Dunedin-Invercargill highway ..	111
Laying bituminous concrete paving on the Dunedin-Invercargill highway	111
Sealing was in hand in 1924 on a hilly section of the Wairoa-Gisborne road	112
The newly improved main road from Wellington climbing the Paekakariki hill in the 1920s	112
The Chatto Creek siphon supplies water to irrigate land across the valley	115
The Arapuni dam across a gorge of the Waikato River	121
Inside the cofferdam excavating shingle from the bed of the Waitaki River	122
Water topping the dam at the Waitaki power station	123
Pack-horses setting out for camps on the Waikaremoana-Galatea road	127
Relief workers widening a road during the depression	127
The Government Departmental Buildings in Stout Street, Wellington	131
Robert Semple, Minister of Public Works, 1935 to 1941, 1942 to 1943, and then Minister of Works to 1949	135
Mohaka viaduct on the Napier-Gisborne railway	139
No. 4 camp in the Kopuawhara valley serving the Wairoa Gisborne railway construction works	140
The same area 2 days later	140
A steam shovel with caterpillar mounting	147
Cartoon: "Its from the new boss"	147
Reinforced concrete aircraft hangars built for RNZAF	150
Intake control structure for the Redcliffs irrigation scheme ..	150
Minister of Public Works addressing a gathering on the Rangitata irrigation scheme	151
Sheep's foot roller and elevating grader on the Rangitata irrigation scheme	151
One of the 12 ft diameter pipes for the Surrey Hills siphon ..	151
Accommodation for workmen at Tawatapu between Pukerua Bay and Plimmerton	153

	PAGE
The Waikaremoana Rotorua highway near Mokau Falls ..	155
<i>Te Anau Milford Sound Road, pp. 154-9.</i>	
Debris from ancient glacier calls for heavy work ..	154
A winter scene at an advance camp on Monkey Flat in 1935 ..	155
A survey camp near the foot of Mount Talbot ..	156
On the descent to the Hollyford coming from the head of the Eglinton valley ..	156
Formation work between the Hollyford River and the hillside ..	156
The heading for the Homer tunnel being driven through solid rock ..	157
Granite hard rocks left by the glacier ..	158
A workman's camp alongside the way cleared for the road ..	159
State housing, Lower Hutt, showing individuality of designs ..	163
H. T. Armstrong, Minister of Public Works, 1941 to 1942 ..	164
Sir James Fletcher, Commissioner of Defence Construction and later Commissioner of Works ..	166
A tractor adapted to serve as an armoured fighting vehicle ..	172
Camp near Paekakariki erected for the American armed forces ..	174
Civil construction unit concreting a runway in Fiji ..	175
E. R. McKillop, Commissioner of Works, 1945 to 1955 ..	183
The Karapiro power scheme, on the Waikato River below Arapuni..	191
The reinforced concrete viaduct carrying the railway to Gisborne across the Waiau valley ..	193
Aerial topdressing below the Remarkables, near Queenstown ..	197
Cartoon: "Up the Garden Path" ..	198
The Kawerau mills operated by the Tasman Pulp and Paper Company	212
Machine hall excavation at Lake Manapouri some 700 ft below the surface of the lake ..	214
The completed machine hall at Manapouri power scheme..	215
New look State housing, Bankwood, Hamilton ..	218
The Gordon Wilson flats in Wellington ..	220
Library block, Rotorua Lake High School ..	222
Main postal headquarters, Wellington ..	224
Lecture theatre at Canterbury University School of Engineering ..	225
Two lecture theatres at Canterbury University School of Engineering..	226
University of Auckland, physics and chemistry portions of the buildings complex ..	227
Chemistry block and physics section of the University of Auckland buildings ..	227
Kawarau River bridges near Gibbston on the Cromwell-Queenstown highway ..	228
The Napier-Taupo highway crossing of the Mohaka River ..	229
Wellington urban motorway looking north from Murphy Street exit ..	232

	PAGE
The Newmarket viaduct brings the motorway from the south into Auckland	235
The motorway into Wellington passes above the ferry terminal and the railway yards	237
The Benmore power scheme with the lake beyond	239
Drilling for the production of geothermal steam at Wairakei	242
The borefield for the Wairakei geothermal power project	243
The Cleddau canyon from the portal of the Homer tunnel	244
Milford Sound hotel at the end of the road	245
The lower Haast River bridge, on the road linking Westland and Otago	245
The Lyttelton-Christchurch tunnel, completed in 1964	246
The concrete lined aqueduct between the Poutu tunnel and Rotoaira	248
A barge on Lake Manapouri transporting part of a scroll case	250
The power station at New Plymouth taken in 1972	251
Wellington airport, opened in 1959	254
Public Works Department, organisation, 1874	286
Public Works Department, organisation, 1896	287
Public Works Department, organisation, 1920	288
Public Works Department, organisation, 1937	289
Public Works Department, organisation, 1947	290
Ministry of Works, organisation, 1957	291
Ministry of Works, organisation, 1970	292
Annual construction expenditure 1871 to 1970	294
Annual construction expenditure 1871 to 1970, proportioned by main activities	295
Total construction expenditure 1871 to 1970, proportioned by main activities, as recorded in annual statements	296
Total construction expenditure 1871 to 1970, proportioned by main activities, adjusted to 1969-70 costs	297
Locations of power stations, North Island	299
Locations of power stations, South Island	300
Diagram of the Raurimu Spiral	313
A train descending the spiral, about to enter the short tunnel	313
Two trains descending the spiral, one higher than the other	315
The village and railway station at Raurimu in 1908	315

KEY TO ABBREVIATIONS

AC	Armed Constabulary
AJHR	Appendices to the Journals of the House of Representatives
AS	Auckland Star
AU	Auckland University
Circ. Memo.	Circular Memorandum
DSIR	Department of Scientific and Industrial Research
Dom	Dominion, Wellington
ECMT(R)	East Coast Main Trunk (Railway)
EP	Evening Post
ibid. (<i>ibidem</i>)	in the same place
MOW	Ministry of Works
NA	National Archives
NIMT(R)	North Island Main Trunk (Railway)
NZE	New Zealand Engineering
NZG	New Zealand Gazette
NZH	New Zealand Herald
NZIA	New Zealand Institute of Architects
NZIE Proc.	New Zealand Institution of Engineers Proceedings
NZOY	New Zealand Official Yearbook
NZPD	New Zealand Parliamentary Debates, i.e., Hansard
N.Z. Soc. Civ. Eng. Proc.	New Zealand Society of Civil Engineers Proceedings
NZWU	New Zealand Workers Union
OWH/ASB	Official War History Aerodrome Services Branch
OWH/PWD	Official War History of the Public Works Department
PW	Public Works
PWD	Public Works Department
RNZAF	Royal New Zealand Air Force
SIMT(R)	South Island Main Trunk (Railway)

PREFACE

By Design is an account of the development of one of the country's largest departments of State—the Ministry of Works. It was not commissioned as the Ministry of Works official history but simply as a centennial publication. The terms of reference provided to the author by the department were extremely wide and I have been left to examine the subject in any way I chose with the one stipulation that the book should be academically sound but presented in such a way as to be of interest to a wider public than professional historians.

For anyone not already acquainted with the scope of the Ministry of Works organisation it is recommended that a preliminary reading of Appendix I will give an understanding of the background and thus lead to a better appreciation of the developments outlined in the main chapters.

References to source material will be found at the end of each chapter.

Appendix II gives particulars of some of the colourful personalities of earlier times. It excludes engineers, as they are well covered in *Early New Zealand Engineers* by F. W. Furkert.

It was intended to have the book published in the centennial year 1971, but the preparation of material proved to be more difficult and time consuming than was originally anticipated.

Departmental records and files are scarce until 1910, but after that date there is an embarrassing abundance of them. Despite their number, not all the most important files have been preserved. There is still a very real need for qualified personnel to decide which records should be kept. My own use of them has been highly selective and at best superficial, but I would like to think this summary of the Ministry of Works history might lead others to a deeper study of some of the areas that I only touch on. This is not a history of public works or engineering developments in New Zealand—I have tried to focus on the department itself.

There are many people to whom I am deeply grateful for suggestions, research, support, and encouragement. What follows is by no means an exhaustive list. As always the staffs of the General Assembly Library, the Wellington Public Library, and National Archives have been most helpful, as have the Ministry of Works own librarians. G. P. Keller, now District Commissioner of Works in Dunedin, recorded 70 hours of interviews with past and present Ministry of Works staff and the tapes have been deposited in the Vogel Building Library where they are already proving as useful to other researchers as they have been to me. Mr Keller also made available to me all the records held by the department in Dunedin and I should particularly like to thank H. Jeffs who saved me much time by pointing out the most interesting of them. At head office in Wellington C. T. Wilkinson was a patient and diplomatic link between the Ministry of Works and myself. Even

this brief account would never have been achieved without the help of C. W. Dassler and J. H. Christie both former members of the department whose invaluable knowledge provided material and information I might have missed. Mr Christie read the entire manuscript and offered many helpful suggestions as well as pointing out some errors. Latterly he also checked all the proofs and compiled the index. The manuscript was also read by Assistant Commissioner R. G. Norman and by Michael Noonan—the latter in a valiant effort to improve my grammar and style. I absolve them from all responsibility for what follows. My typist Penny Oldfield deserves special thanks for coping with the erratic copy she got. Finally, thanks are due to the staff of the Government Printing Office for their part in the production.

ROSSLYN NOONAN

CHAPTER 1 / *The Genesis*

"In no other country has a Public Works Department fulfilled such a wide role and had such a significant impact on the development of the country and its landscape."

Dr G. T. Bloomfield at the Twenty-first International Geographical Congress, New Delhi, India, December 1968.

There was no Public Works Department in New Zealand until 1870. But there were public works before that: in some areas they were quite extensive, in others almost non-existent.

The first consideration of the earliest European settlers was for safe navigation—the sea linked them with the world and with each other. Charting the coastline, particularly the harbours, and improving safety conditions by establishing lighthouses had top priority. As for internal travel the new arrivals used the Maori methods—waterways, beach paths, and bush tracks. After British annexation in 1840 the isolation of the existing settlements severely hampered effective administration but the first Governors were in no position to improve communications. What little finance they had available for public works was spent in establishing the capital at Auckland*.

Captain William Hobson appointed William Mason as Superintendent of Works before he left Sydney to assume the first governorship. Mason arrived in the Bay of Islands during March 1840.¹ He was an architect and his profession reflects the emphasis of public works in the early forties. When Hobson arrived at Kororareka accommodation was so primitive that he was forced to live aboard his ship. Mason's first task was to organise temporary living and working quarters for the Governor and his entourage. In September an official party of nine headed for Auckland to begin the establishment of a permanent capital.

The essentials of a Government complex in the new colony included a residence for the Governor, a post office, courthouse, gaol, and customs house.² Roads were apparently the responsibility of the Surveyor-General and they were the subject of many complaints from the first European residents. According to one, Queen Street was an impassable bog, while an excursion to Karangahape Road was an adventure.³

None of the other settlements fared much better. As late as 1856 Dunedin was described by a visitor as a "little muddy village".⁴ After the seat of Government was transferred from the north, public works were neglected in

*The public works estimates for 1841 totalled £5,340. Furkert, F. W., *Early New Zealand Engineers*, Wellington, 1953, p. 26.



Princes Street, Dunedin, 1861. *Hocken Library.*

that area. A Monganui County Councillor, speaking at the turn of the century, recalled those early conditions:

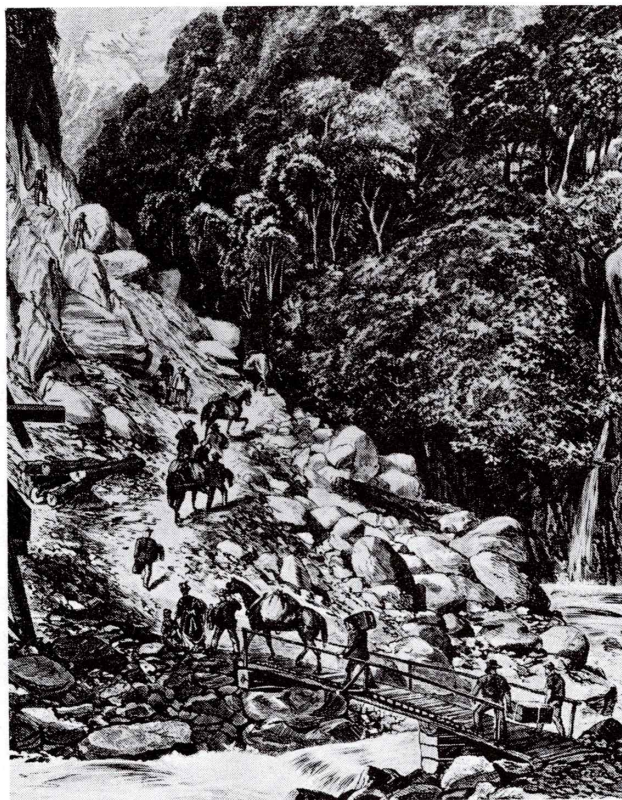
“Roads! Why, you of today don’t know what roads are. Mud! Why, there isn’t any mud today. You dare to complain of mud! In the old days we could have buried a county chairman and, say three generations of county councillors in one mud hole, and then lost a horse or two in riding over them.”⁵

Following annexation, roading and public works usually remained the responsibility of the individual settlements and in the circumstances this was the only realistic arrangement as it was impossible for a central body to effectively assist or control much beyond its immediate surroundings. In fact the settlements struggled to provide even basic facilities and were incapable of developing the hinterland. What little they did achieve was frequently forced upon them by exigency. An increasing demand for land, and the need for adequate defence against potentially hostile Maoris, dictated several major public works projects. Wellington, for example, recognised

the need for land routes out of the area, and construction was begun on one exit up the Horokiwi and over the Paekakariki Hill, and on another over the Rimutakas.⁶

The establishment of a federal form of government in 1852 was a recognition of the need for local control as long as communication between the regions remained minimal. But decentralised government had several drawbacks. The provinces were concerned exclusively with the internal development of their own areas. No attempt was made to improve colony-wide communications. Naturally progress, such as it was, related directly to the prosperity of the individual province. The discovery of gold in the South Island ensured relative affluence in the south. Public works in Otago were in an advanced state by 1870. Writing in 1956, engineer G. J. Jones observed that by 1869 metalled and sometimes paved roads traversed the Otago Province much as today.⁷ Modern engineers confirm the excellent quality of the workmanship:

“These were not hit and miss jobs, many being well constructed macadam roads. . . . while reconstructing part of the Milton-Queenstown State High-



Otira Gorge, Westland. A temporary footbridge at Wallace's Point, 1876. *Turnbull Library.*

way [the engineers] saw ample evidence of the thoroughness of the 'highwayman' of the 60s. Miles of that 'Golden Highway' were pitched with quarried rock placed on edge and fitted closely together, this being covered with a running-course of gravel. . . . When regrading the new highway through this pitching, the standard of workmanship after 80 years could be well appreciated, and it is a fact that some of that undisturbed foundation is incorporated in the modern road, carrying today's traffic just as well as it carried heavy wool and wheat wagons for over half a century."⁸

Most districts were not so fortunate. On the West Coast in 1871 there was not a single dray road leading out of Greymouth. All inland communication was by boat, horse track, or the occasional tramway. The Rodney member of the House of Representatives lamented that even at the end of the 1870s his electorate had nothing approaching a macadamized road:

"As far as country districts are concerned, I represent one in which Macadam is only known by repute. In that district there is not a furlong of macadamized road, and the only roads are those primitive ones which the earliest pioneers and engineers of the country—the bullock-drivers—laid out for themselves for the purpose of dragging timber out of the bush."⁹

Both Otago and Canterbury were able to begin railway construction and had lines operating before 1870, as did Southland before it merged



The predecessor of bridges. Using a guide rope, anchor ropes, and pulleys the ferry was angled so that the current moved it across. *Turnbull Library.*



The Lyttelton end of the tunnel to take the railway to Christchurch. 1860s. *Turnbull Library.*

with Otago. In 1867 the Lyttelton Tunnel, linking Christchurch with its seaport was opened—a notable achievement for a small community especially when the basic tools were the pick, shovel, and wheelbarrow. However, had railway building been left to the provinces, New Zealand may well have faced a proliferation of gauge sizes. There was no technical integration of the provinces' various plans, and by 1870 there were three different gauges for the limited amount of construction already done*.

Some idea of how slow and laborious public works were before mechanisation can be gauged from A. H. Reed's description of metalling a road at the end of the century:

"First, a dray-load of rocks (blue metal), averaging perhaps from 9 to 12 in. each way, would be dumped down by the side of the road, and these would have to be broken into smaller pieces by sledge hammers. Smaller implements, known as knapping-hammers, were then brought into use for breaking these smaller fragments into the regulation size. A certain dexterity was required in the use of the knapping-hammer, which had a slender teatree handle, slightly resilient, and easily snapped by a novice, but there was

*Canterbury had 5 ft 3 in., Otago 4 ft 8½ in., Auckland 3 ft 6 in. The lines opened before Vogel's public works programme took over railway construction were Lyttelton to Christchurch, Christchurch to Selwyn, Addington to Kaiapoi, Invercargill to Bluff, Invercargill to Winton. Those partially constructed were the Newmarket to Drury, and Dunedin - Port Chalmers lines.

plenty of material available for shaping a new handle. After the job was completed, and the broken stones spread over the road to a requisite width and depth, the county engineer made an inspection, testing stones here and there with a 2½-in. ring through which, if the job had been properly done, the stones ought to pass.”¹⁰

While Otago and Canterbury benefited from the gold rushes, general development in the North Island was curtailed as European and Maori fought for possession of the land. Nevertheless as a result of this hostility between the new settlers and the Maoris some fine roads were built by the Imperial forces as protective measures. Both before and during the wars strategic roading programmes were undertaken. Because it was the capital, Auckland initially suffered the least. By 1870 it boasted a number of substantial public buildings and had begun railway construction though no lines were opened. But the capital was transferred to Wellington and Auckland succumbed to the economic slump of the late sixties. In the south gold-mining declined and even Otago and Canterbury faced depression. The situation revealed the basic instability of New Zealand’s economy. It was hopelessly fragmented with little co-operation between the nine provinces. The colony lacked a reliable export and it had no adequate system of internal transport on which to build a united economy.¹¹

At this time of economic stagnation Julius Vogel, “one of the most colourful and influential politicians in the history of New Zealand”,¹² became Colonial Treasurer. His remedy for the country’s problems was a huge programme of public works to be undertaken by the Central Government. During the sixties the latter had become involved in opening up the country in a minor way—by subsidising the provinces, by commissioning surveys, and by constructing some roads. Vogel’s proposals resulted in public works becoming the Government’s major preoccupation for 15 years. To execute this programme the Public Works Department was created. It outlived Vogel’s policy and grew to be one of the biggest and most influential departments of State.

REFERENCES CHAPTER 1

¹Stacpoole, J., *William Mason—The First New Zealand Architect*, Auckland, 1971, p. 24.

²*Ibid.*, pp. 26 and 35.

³Quoted in Jones, G. J., “Salute to Highwaymen”, *Engineers and Assistants Association Year Book No. 10*, 1958, p. 21.

⁴*Ibid.*

⁵Quoted in Reed, A. H., *The Story of Northland*, Wellington, 1956, p. 285.

⁶Furkert, F. W., *Early New Zealand Engineers*, Wellington, 1953, p. 30.

⁷Jones, p. 25.

⁸*Ibid.*

⁹*New Zealand Parliamentary Debates* (hereafter *NZPD*), Vol. XXX, 16 October 1878, p. 844.

¹⁰Reed, pp. 285–286.

¹¹Simkin, C. G. F., *The Instability of a Dependent Economy*, Oxford, 1951, pp. 144–145.

¹²Stone, R. C. J., *Economic Development 1870–90*, Auckland, 1967, p. 2.

CHAPTER 2 / *Establishing The Department*

"Perhaps not even the Financial Statement is looked forward to with as much anxiety as the Statement of the Minister of Public Works, who each year has to tell the country how the funds which can be devoted to the construction of railways and in [sic] other public works is to be expended. This is the all-important subject to . . . the colony. . . ."

New Zealand Herald, 10 December 1879.

The setting up of a Public Works Department was first proposed by William Fitzherbert, member of the House of Representatives for Hutt. On 28 June 1870 the Colonial Treasurer, Julius Vogel, delivered his Financial Statement to the House. The basic theme was the urgent need to promote settlement in New Zealand. He proposed to open up the country with extensive public works, particularly roads and railways, and to attract



Sir Julius Vogel (1835–99), at the time Colonial Treasurer, took the leading part in setting up the Public Works Department. *Turnbull Library*.

settlers by assisting immigration. To finance his scheme he advocated borrowing overseas £10 (\$20) million* over a period of 10 years. Nowhere in the address did Vogel suggest how such a scheme would be supervised. This lack of concern for administrative detail was to create many problems in the execution of the public works programme.

In Parliament immediate reactions to Vogel's proposals varied from incredulity to enthusiasm—and were frequently a combination of both. R. G. Wood, Member for Parnell, had “never heard of a scheme so wild, so unpractical, and so impracticable”.¹ Another member feared that the historian of the future would consider it:

“The Vogel Bubble—the most ruinous speculation of modern times. It was projected by Julius Vogel, who had raised himself to the dignity of Finance Minister; it was miserably conceived, and afterwards dishonestly managed. It commenced in 1870, and exploded in 1880, ruining thousands of families, and Mr Smith, the cashier, absconded with £100,000 [\$200,000].”²

It was the massive borrowing plan which unnerved these members. As one pointed out, “we have been altogether demoralised and puzzled by having immense sums paraded before us. We, who have been, for years past, haggling over £5 additional salary for some poor post office clerk or office messenger, are now tossing about millions.”³ The majority, however, saw Vogel's plan as a panacea. A colony-wide communications system “would strongly tend to unity of sentiment, and render possible something like patriotism in the country”.⁴ It would create a nation where previously there had been only a collection of provinces. The public works proposals were also seen as the solution to Maori-Pakeha problems in the North Island. The interior of the island would be opened up, surveillance of the Maori made easier, and increasing numbers of European settlers would counterbalance the native population. Above all Vogel's statement was welcomed as a much needed boost for the stagnating economy.

But even among parliamentarians who supported “the great colonial scheme” (as it came to be known), there were reservations. When Vogel introduced the Immigration and Public Works Bill, William Fitzherbert noted that “there is no provision in the Bill which will show us, when once we have voted the money, how it must necessarily be administered”.⁵ He did not think the House should vote even £1 million let alone 10 times that amount if it was not prepared to closely follow up its administration. To remedy the situation he suggested that a distinctive department be set up and that a Minister for Public Works and Immigration be appointed.⁶

In its final form that is just what the Immigration and Public Works Act 1870 provided for.⁷ The Governor was also given power to appoint “such Agents Sub-Agents Engineers Surveyors Clerks and other Officers in New

*It would be simple to express £s in terms of the present day \$ were it not for the fact that since 1914 inflationary trends make simple financial comparisons difficult.

Zealand or elsewhere as he may think requisite for effectually carrying out the powers herein conferred upon him".⁸ In their first year of appointment salaries were to be paid out of money allocated to the undertaking in which they were engaged. Thereafter the salaries were to be determined by the General Assembly as in the case of other civil servants. Engineers and other skilled men engaged overseas for service in New Zealand were exempted from this policy during the first 5 years of their employment. Within 10 years accusations had been made that appointments to the department were often based on political considerations rather than ability, and that salaries were unduly high.

Once the Act was passed widespread enthusiasm for public works ensured that a department was established without delay. Royal assent was given to the Act on 12 September. Fifteen days later it was announced that His Excellency the Governor had been pleased to appoint the Honourable William Gisborne, Minister *ad interim* of Immigration and Public Works. Gisborne had a particular interest in public administration. He had previously held offices in the public service and in 1866 had served on a Royal Commission inquiring into its efficiency. He devised a form for the new department which was to remain unchanged for over 60 years; even then reorganisation hardly affected the basic core of the administrative structure.⁹ When he was appointed *ad interim* Minister, Gisborne was already Colonial Secretary. The Colonial Office was an essentially administrative department, whose permanent head was naturally an administrator. In setting up the Public Works Department he followed the same pattern. But now he was dealing with a technical body and his failure to see the difference left unresolved the question of ultimate responsibility and subsequently caused an unpleasant conflict between the technical and administrative heads of the Public Works Department. Initially the under-secretary was the permanent head and responsible to him was the technical head, the engineer-in-chief. New Zealand was divided into areas, each with its own district engineer responsible to the under-secretary. Engineers were also appointed to specific works or activities and these men were often directly responsible to the engineer-in-chief. As long as the under-secretary was primarily the administrator, and his superiority to the engineer-in-chief of no practical significance, this division of powers seemed to operate smoothly. But the appointment of a senior engineer to the post of under-secretary, in the early 1880s, began a power struggle between the two offices for ultimate control of the department that was only resolved in the 1920s.

By July 1871 the permanent staff of the Immigration and Public Works Department was about 30.¹⁰ Less than a year later the number had quadrupled. If temporary employees and individuals on contract to the department are included the figure is over 200.¹¹ Of the original 20, 7 were

immigration officers soon transferred to the Department of Crown Lands*. The remaining 13 included the under-secretary, 8 engineers, 3 clerks (1 of whom doubled as a draftsman) and an accountant. All except the accountant and the records clerk came to the department from other branches of Government service. The backgrounds of the department's first engineers reflected the colony's predominantly British origins. Three were Englishmen, two Scots, two Canadians, and one Bavarian, and both the Canadians had been partly educated in England.¹² Karl Herman Weber, the odd man out, was one of many Europeans who fled from their homelands after the failure of the liberal uprisings in 1848. He had worked in the United States and South America before coming to New Zealand in 1860. William Bray, Christchurch's first district engineer, was equally well travelled. Though born in London he had been educated in Switzerland and had worked in Tuscany and Egypt. All brought a wide general experience of engineering to their work in the department. Prior to his appointment as acting engineer-in-chief, John Blackett, for example, had worked on railways and in copper mines; he had built bridges, iron ships, roads, and public buildings; he had investigated mudflat reclamations, harbour improvements, and water races. Later, as marine engineer, a post that he held concurrently with his Public Works Department appointments, he added lighthouse construction to his list of achievements. Despite this extensive experience Blackett was not

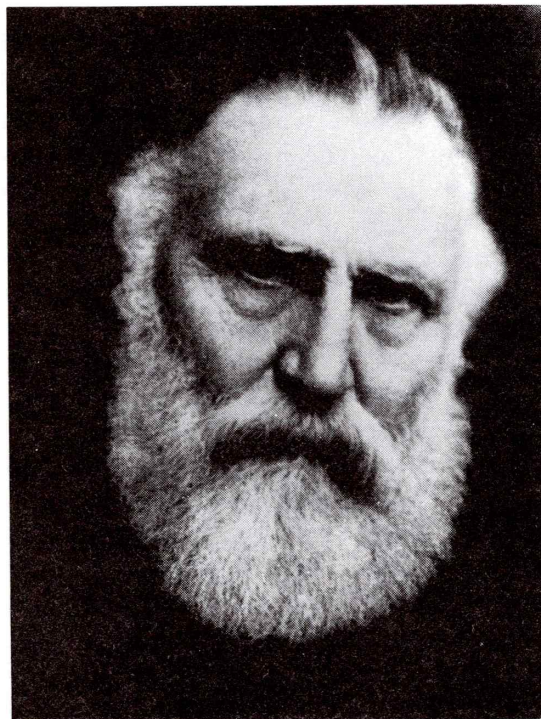
*In the Fox Ministry both W. Gisborne and J. D. Ormond had been gazetted as Minister for Public Works without any mention of immigration, though both had included a section on immigration in their annual reports. In the shortlived Stafford Ministry, formed 10 September 1872, Donald Reid was gazetted as Minister for Public Works and William Fitzherbert as Secretary for Crown Lands and Immigration. (*New Zealand Gazette*, 1872, p. 725.) Section 43 of the Immigration and Public Works Amendment Bill 1872 provided that the Minister of Immigration need not necessarily also be Minister of Public Works. The Bill, with this particular clause unaltered, was finally passed on 23 October. The Waterhouse Ministry had then succeeded Stafford's and G. M. O'Rorke was appointed Secretary for Crown Lands and Minister for Immigration. (*New Zealand Gazette*, 1872, p. 787.) The separation of immigration from the administration of public works was then complete and final.

John Blackett (1818–93). *Ministry of Works*.



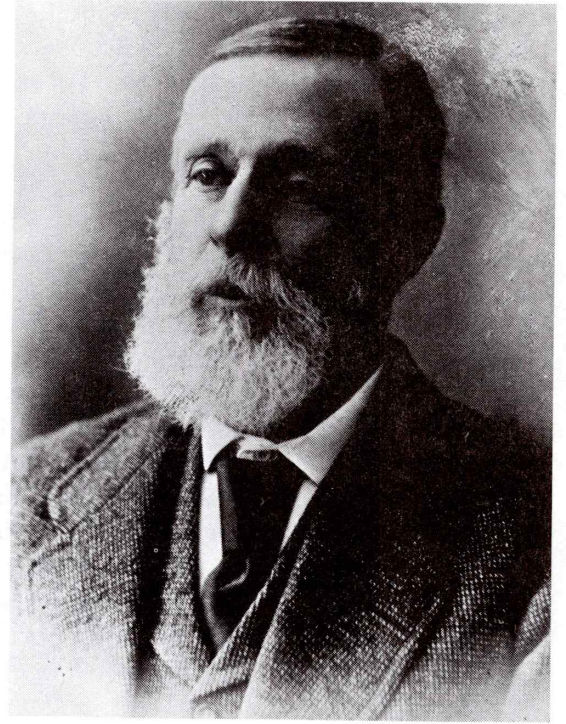
appointed the first engineer-in-chief. He had been in New Zealand since 1851 and that was too long. Gisborne wanted “someone selected in Europe experienced in the construction of modern railways”.¹³ In Parliament, James Richmond warned that “one of the worst places they could go to for engineers for their purpose would be England”.¹⁴ Just why this was so he never made clear and his warning went unheeded. Vogel, in London to raise the first loan for his scheme, selected John Carruthers for the post. Carruthers’ qualifications were impressive. A tall Scot from a literary family, Carruthers had originally intended to become a printer and editor like his father. However, engineering appealed to him more and he had gone to work on the Great Western Railway of Canada. Later appointments involved railway construction in the United States, Russia, Mauritius, and Egypt, as well as irrigation work in India.¹⁵ Clearly his experience and his interests were even more diverse than those of his fellow engineers already in New Zealand. A few months after Carruthers was appointed engineer-in-chief, Gisborne was relieved of his *ad interim* post and John Davies Ormond, gentleman farmer from Hawke’s Bay became Minister of Public Works.

Not long after Ormond’s appointment, however, responsibility for the department was divided. A new portfolio was created—that of Resident Minister for the Middle Island*. Vogel maintained that the measure was a



John Carruthers (1836–1914), the first Engineer-in-Chief of the Public Works Department. *Ministry of Works.*

*The South Island was commonly known by this name until early in the twentieth century.



John Davies Ormond (1832–1917), Minister of Public Works, various times 1871 to 1877. *Turnbull Library.*

temporary one designed to cope with the “enormous amount of work pressing upon us in both Islands, more than could be overtaken at once by any Minister”.¹⁶ In fact the new portfolio was almost certainly created to allay the fears of the powerful southern provinces that the North Island would absorb all the public works money. It was one of several attempts in the first 15 years of the department’s life to decentralise its administration and thus maximise parochial influence. None of them were successful. In this particular case, after operating the system for a year Vogel announced that the Resident Minister would not continue to use his office as a central Public Works Department for the South Island, and he explained why:

“... for the simple reason that it does not work well, because it leads to a division of papers which are applicable to both Islands, while it also gives rise to considerable delay in the payments which are made from the Treasury, through the necessity of accounts passing through the Middle Island office. There is also this to be considered: that Nelson, at any rate, is a part of the Colony the affairs of which can be much more readily administered from Wellington than from Christchurch.”¹⁷

However, the return of responsibility for South Island public works to Wellington did not adequately centralise control over them. The efficient

execution of the public works programme was hampered by the complex relations of the provincial administrations to the Central Government. From 1870 until their abolition in 1876 the provinces were forbidden to raise loans for public works, although some of the finance authorised by the Immigration and Public Works Loan Act 1870 was available to them on application. However, all work financed in this way was subject to the supervision of Public Works Department staff. Unfortunately clearly defined areas of responsibility were never established and unnecessary waste and poor workmanship resulted. The report of the Rakaia Bridge Commission, set up to investigate its rapid deterioration, vividly describes the chaos that surrounded the bridge's construction:

"The whole conduct of the District Engineers, in connection with the Rakaia Bridge, has been of the loosest description. Mr Tancred retires from office without taking care to leave data as to the intention of the General Government regarding deviations sanctioned. His successor (Mr O'Connor) takes office, and is not aware on what plan the bridge is to be constructed. He consents to alterations and eventually passes the bridge . . . without having before him any authorized plan whatever."¹⁸

The report blamed O'Connor for particular failings in construction but then went on to single out the provincial engineer as ultimately responsible because the contract for the bridge "points to him as the chief officer who had power to interfere with the construction of the bridge, subject to the consent of the General Government".¹⁹ This last phrase reveals the total confusion of the situation. It was not an isolated incident. A year later another inquiry revealed similar mismanagement of the Grey Gorge Suspension Bridge.²⁰

Abolition of the provinces represented a significant change in public works administration, but parochialism did not disappear with a single piece of legislation and the department was threatened with several attempts to decentralise its responsibility and diminish its authority over public works even after 1876.

The department was created to survey and appraise projects, to draw up plans and specifications, to supervise contractors, but not to undertake construction work itself. Vogel's initial proposals provided for the development of railways, roads, and water races to the goldfields. In the first year the activities of the department centred on railway building—an emphasis that continued for 40 years. The first lines were in Otago, Canterbury, Marlborough, Nelson, and Auckland*. Vogel alleged that there was sufficient professional information available on these projects for construction to begin at once. In fact he was unduly optimistic—and typically ignorant of details. The department had to resurvey several of the lines. In addition major modifications were necessary to the plans provided by the provincial govern-

*The lines were: Dunedin to the Clutha River; Christchurch to Rangiora; Selwyn to Rakaia; Timaru to Temuka; Picton to Blenheim; Nelson to Cobden; Auckland to the Waikato Bend. (*NZPD*, Vol. 9, 18 August 1870, pp. 95–6.)

ments. A basic alteration involved the substitution of the narrow 3 ft 6 in. - gauge for the broad or medium gauge lines favoured by Canterbury and Otago. Canterbury was especially vigorous in its opposition to the narrow gauge but finally economic considerations prevailed.²¹ The department was also instructed to compile all the information necessary for five further lines*.

In addition to getting the railway construction programme under way, the Public Works Department had to assess roading requirements in the North Island and the county of Westland, then organise their development; and investigate the need for water races to the goldfields. Blackett's description of his travels in that first year gives some idea of how extensive the department's activities were:

"I have visited the following districts, viz: from Wellington overland to Manawatu; Manawatu Valley, to Palmerston, and beyond to summit of range south of Manawatu Gorge; Rangitikei, Wanganui, to Waitotara, Patea, and thence overland to New Plymouth; thence to Auckland and along line of Waikato Railway to Onehunga and Tuakau, thence to Mercer. I next visited the Thames in connection with water supply; thence to Tauranga, and along portions of South Road to Taupo, and other roads in the district.

In Wellington I have inspected proposed lines of railway into Wairarapa, but have not been beyond Masterton in that district.

In the South Island I have inspected lines of railway, in progress and projected, as follows: Christchurch to Rangiora, and beyond, across Ashley River, by two lines; Selwyn to Rakaia, . . . Timaru to Temuka, Rangitata Bridge, Moeraki to Waitaki, and Waitaki River in connection with bridge site. Dunedin to Clutha, Clutha to Maitara (partially), Maitara to Invercargill.

I also inspected Invercargill railway to Winton and the Bluff, and visited Dog Island Lighthouse and Nuggets Lighthouse.

In Westland I have visited, along with Dr. Hector, the Grey and Grey Valley, to coal mines, and as far as Ahaura; also Hokitika, and the several districts between these places; as well as Ross and Westport.

In Nelson I inspected, on different lines, the proposed railway to Foxhill."²²

Given the extremely difficult nature of travel within New Zealand, Blackett's trips undoubtedly occupied a large proportion of his time. In fact maintaining adequate communication between head office and the district engineers was one of the many difficulties Public Works Department staff faced. The quickest and most efficient method was the telegraph, where

*The lines were: Invercargill to the Maitara; Moeraki to Waitaki; Wellington to Seventy-Mile Bush, and from there to Napier and New Plymouth. (*NZPD*, Vol. 9, 6 September 1870, p. 534.)

facilities for it existed. But head office quickly became cost conscious and engineers were often called on to justify their use of it.²³ Eventually a circular was sent round all the districts restricting its use.²⁴ At least one engineer found the quickest way to Wellington was to walk there. J. T. Stewart, in charge of the area from Manawatu to Wanganui, would come down the coast, inspecting jobs on the way, whenever he felt consultation with head office was essential.²⁵ Lack of communication was not just a departmental problem, it was essentially a New Zealand one. Devising ways and means of improving internal links for the colony as a whole was the Public Works Department's primary task.



Through mountain tussock on the way to Central Otago a convoy of covered wagons traverses the Pigroot. *Otago Early Settlers Museum, Dunedin.*

By the end of the second year it seemed to have made a good start on the job. Five hundred and seventy-seven miles of roads had been opened, 12 miles of railways constructed under its supervision, and a further 379 miles surveyed and prepared for contract.²⁶ But Vogel had whetted the New Zealander's appetite for public works. Within days of announcing his scheme his office had been deluged with deputations from all over the country: "There is scarcely a part of either Island", he stated "at any rate from Auckland to the Bluff, as to which representations have not been made to the Government that it was desirable that railways should be constructed."²⁷

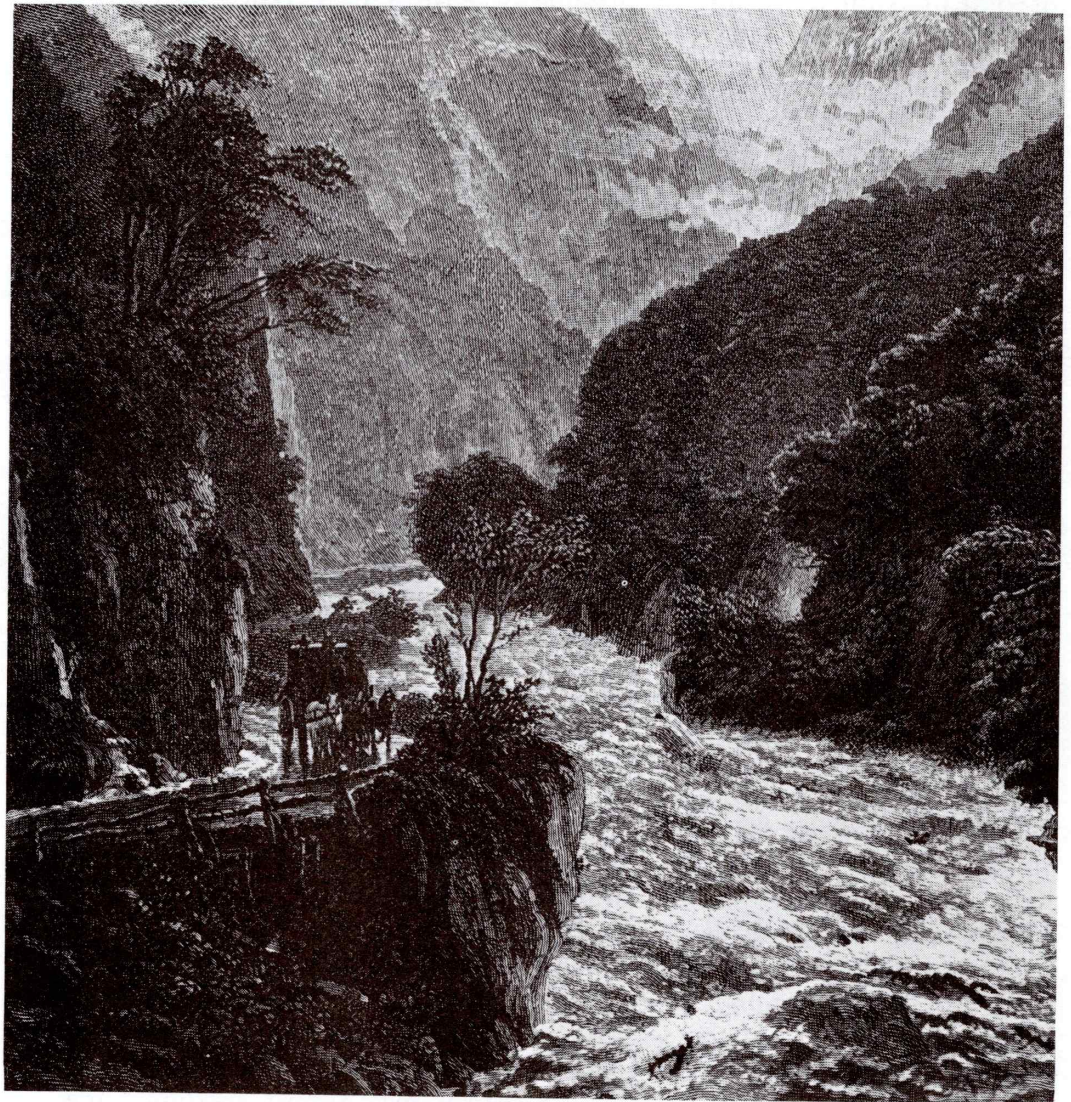
By 1872 there was barely a part of either island which was satisfied with the amount of public works allocated to it. For the first, but not the last time, execution of the public works programme became the focus of a bitter debate in Parliament. In this case criticism was almost entirely aimed at the Government and certain political decisions taken by it. The department

itself was seldom mentioned, though it was not to escape so lightly in later crises. At the end of the debate three motions put by E. W. Stafford were carried by small majorities. They amounted to a vote of no confidence and forced the Fox Ministry to resign. The first motion proposed "that, in the opinion of this House, the administration by the present Government of the public works and immigration policy has been unsatisfactory"*. Although there was no general consensus of opinion among the Ministry's critics, most

*The other two motions were:

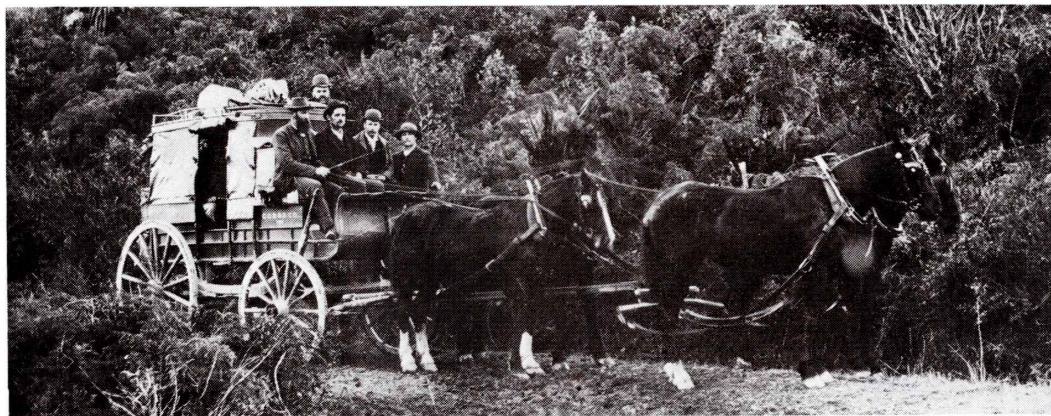
"That the habitual absence of Ministers from the seat of Government during the recess, which results in their conducting important operations without frequent opportunities of consulting each other, prevents that concert and unity of action between the several departments essential to the efficient direction of public affairs, either executive or legislative, and largely increases the cost of government."

"That, in order to administer the public works and immigration policy in the most efficient and economical manner, the Colonial Government should retain the full responsibility for the proper conduct of all works authorised, and the sole control over all sums voted by Parliament; and should when practicable, avail itself of any existing provincial or other local machinery in the supervision or execution of such works." (*NZPD*, Vol. 12, 21 August 1872, p. 574.)



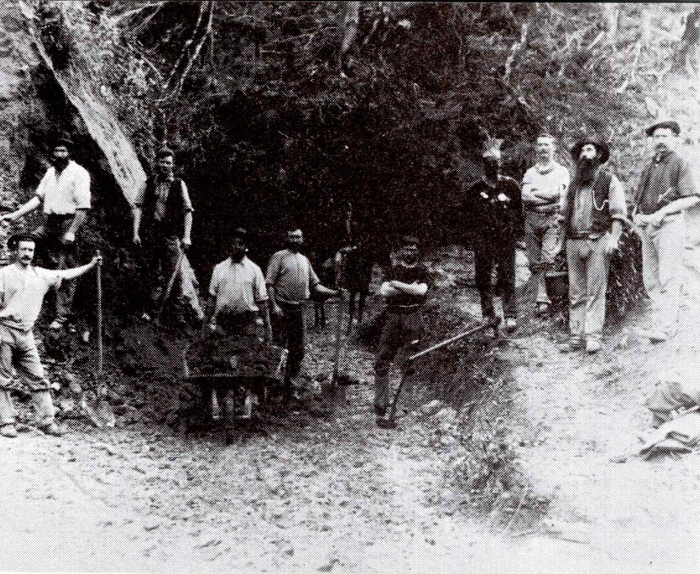
A flood in the Otira Gorge. The coach service commenced in 1866. *Pictorial New Zealand*, 1895, p. 244.

agreed with a resolution passed at a public meeting in Auckland, which said in part that "the conduct of the public works and immigration policy of the Colonial Government has hitherto been characterized by neglect, delay, and waste of public money. . . ." ²⁸ In their opinion the department's work should have been accelerated and redirected—undertakings were all too frequently in the wrong place for the wrong reason. The Minister of Public Works himself was accused of having the route of a railway line diverted in order to enhance the value of his own property*. In fact allegations of manipulation of the works programme for political and private ends were frequent throughout the debate. These varied from charges like that made against Ormond, to accusations that the powerful provinces, through their superior representation in Parliament, had commandeered all the available finance for public works. On the other hand some members argued that provincial and local control would overcome the difficulties and dangers of centralised administration. ²⁹ The question of responsibility was a contentious one at several levels in the department. If it was difficult to delineate responsibility at the local level the problem was even worse at the top. Fitzherbert had suggested a separate Minister and distinctive department as a minimum requirement. Others had gone further. The idea of a Board of Control independent of political pressures had been mooted in 1870. ³⁰ It had received such strong support that the Immigration and Public Works Act 1870 provided that the Minister might "be assisted in the administration of this Act by any persons as a Board . . . to be from time to time appointed by the Governor for the purpose. . . ." ³¹ Vogel had promised, when the Act was passed, that such a board would be constituted before the following session of Parliament and would be submitted to it for approval. ³²



Early travel between Nelson and Murchison. The coach crossing the Hope Saddle. *Tyree Collection. Turnbull Library.*

*Ormond replied that the charge was "absolutely incorrect". He stated that he had 1,000 acres on the Napier Plains and that the railway ran for 20 miles through the plains. An engineer had surveyed three possible lines, one through his property, the second 2 miles from it, and the third over 3 miles away. The third was chosen after inspection by the engineer-in-chief on economic grounds. (*NZPD*, Vol. 13, 5 September 1872, p. 135.) The original charge had alleged, however, that the railway was initially planned to follow quite a different route. (*NZPD*, Vol. 12, 22 August 1872, p. 619.)

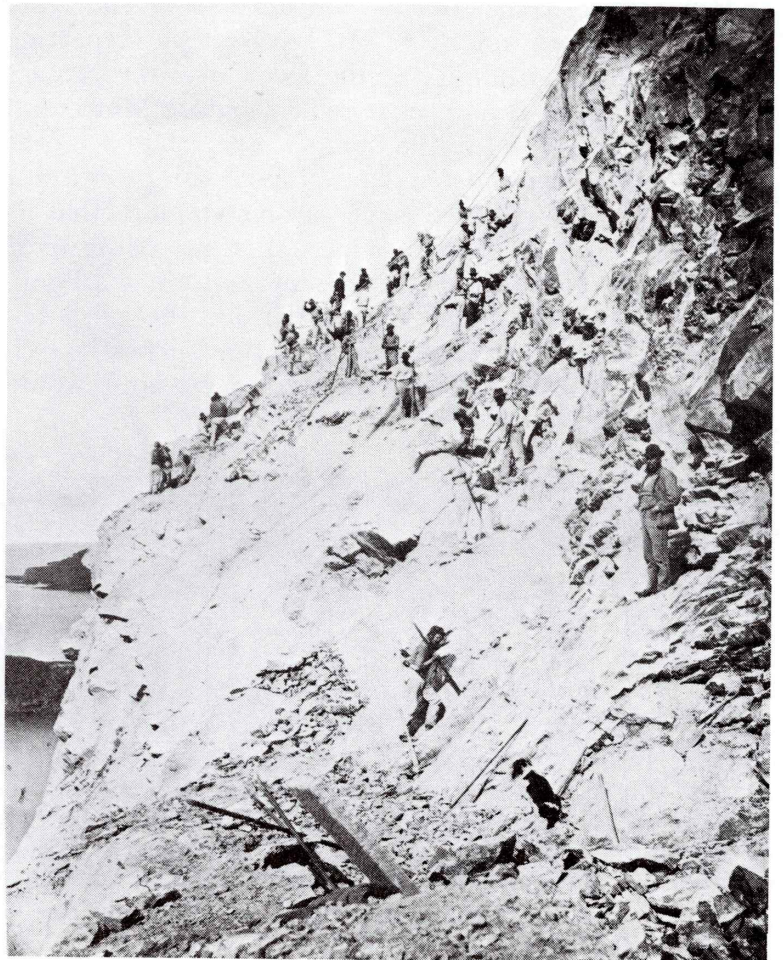
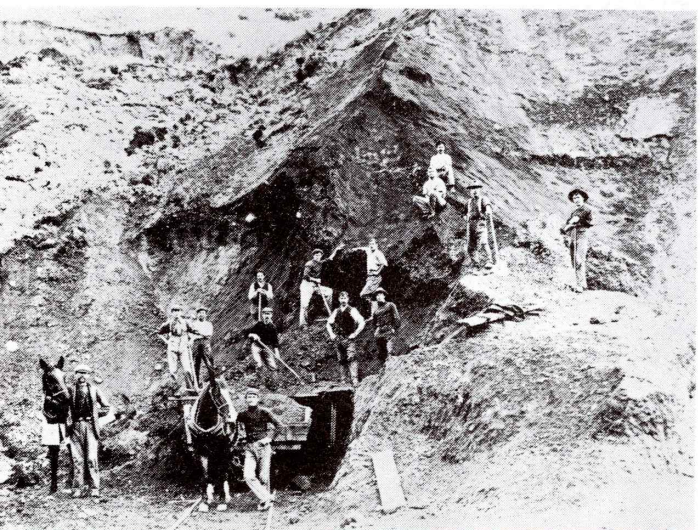


LEFT TOP: Turnbull's gang on road construction in Taranaki. Note the man on left with bowyongs below his knees. *McAllister Collection. Turnbull Library.*

LEFT MIDDLE: End tip wagons ready to go to the tip. Note the sprag to stop the wheel of the leading truck from turning. When they hit a stoplog at the end of the track the body would tip and shoot the contents into the filling. *New Zealand Railways Publicity.*

LEFT BOTTOM: Early railway construction workers with picks, shovels, and wagon. Note the rills to lead the earth to the platform, giving easy shovelling into the truck. *Turnbull Library.*

BELOW: Near Purakanui in 1875 workmen prepare to blast the cliff face when constructing the railway north of Dunedin. *New Zealand Railways Publicity.*



BY DESIGN

The problem was how to retain for the elected representatives of the people the ultimate right to decide public works policy while avoiding the situation where "every Province should dip its hand into the colonial purse, and carry away as much as it can seize in the general scramble—the strongest Provinces, of course, taking the largest share".³³ When Vogel and Gisborne finally submitted proposals for a board at the end of September 1871 they included the provision that the Disqualification Act should not apply to members of the board.³⁴ In practice this meant that members of Parliament would be eligible and so offered no solution to the problem of political pressure. Indeed one member of the House went so far as to describe it as the most ingenious engine for corrupting a legislature he had ever known.³⁵ The idea was dropped and Parliament turned to the senior officers of the Public Works Department to ensure that decisions were made only on technical and economic grounds. The Legislative Council added a clause to the Immigration and Public Works Amendment Bill stating that "the Minister of Public Works shall be assisted and advised by the Chief Engineer and the Assistant Engineer."³⁶ Presumably it placed some obligation on the Minister to accept or at least seriously consider the advice of his officers. But it was unacceptable to the Government which argued that it diminished the responsibility of the Minister without defining that of the two officers. Ultimately the amended Act simply allowed that there should be a report on all works to be carried out, from the engineer-in-chief or his deputy and that such reports should be laid upon the table immediately after the Assembly met. It developed that a basic consideration of these reports was whether or not the proposed line would earn the interest on the cost of construction. The engineer-in-chief was supposed to certify that it would before building could proceed. It was not a popular task with the top professional officers and a subsequent engineer-in-chief remarked that for obvious reasons the repeal of this controversial provision was not opposed by his predecessors.³⁷ It is doubtful how much effect, if any, this provision had on the decision-making process for adverse reports on particular projects were ignored when political influence was strong*.

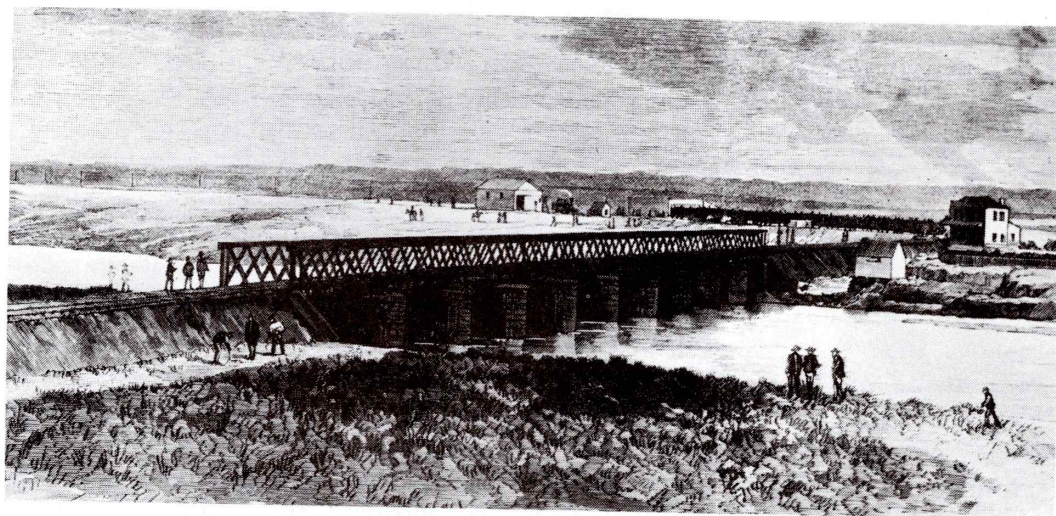
A particular aspect of the Government's administration of public works up to 1872 which aroused more criticism than any other was the method of awarding contracts†. While in England in 1871, Vogel had negotiated two alternative agreements with a large British firm of railway contractors, Brogden and Sons. Parliament rejected the first of these agreements, somewhat modified the second and awarded the firm six contracts in 1872‡. The critics of these contracts argued that the work could have been carried out more cheaply by local firms§. According to one member of the House of Representatives "Mr Brogden has succeeded in making arrangements with the Ministry more favourable than any that were ever entered into by a

*The Otago Central railway and the Midland line are two examples where such advice was ignored. They are discussed in chapter 3.

†G. W. Heron in an M.A. thesis, "The Development of Railway Policy in New Zealand and the Growth of the North Island Railway System Before 1908", Univ. N.Z. Auckland College 1946, p. 35; summarises the reasons for employing English firms: "... risk was lessened by dealing with a large firm and ... colonial contractors would have been crippled by the shortage of skilled labour". The Government felt that in addition to being more reliable the English contractors would bolster the immigration scheme by importing large numbers of manual workers. Experience, however, did not confirm these views.

‡The railway lines involved were: Auckland to Mercer; Napier to Pahi Paki; Wellington to Hutt; Picton to Blenheim; Dunedin to Clutha; Invercargill to Maitara. (*AJHR*, 1872, Vol. II, D. 19.)

§They also feared Brogden's political influence. A. S. Collins, member for Collingwood, summed up this sentiment: "Mr Brogden is a power in the State, and he will be a power overtopping that of the Ministry, and he will find it necessary ... to buy support, and we know out of whose pocket payment for that support must come". (*NZPD*, Vol. 12, 22 August 1872, p. 619. See also *ibid.*, 21 August 1872, p. 593.)



In August 1875 the railway was opened from Mātaura to Gore. Here the excursion train from Invercargill stops just before the bridge over the Mātaura River. *Illustrated N.Z. Herald* by courtesy General Assembly Library.

contractor; and we know, even in the case of the Wellington railway, the price at which Mr Brogden contracted to execute the works for was double that for which local contractors would do it".³⁸ Similar charges were made about the Dunedin to Clutha, the Invercargill to Mātaura, and Auckland lines.³⁹ These charges directly involved the Public Works Department because the contracts were based on departmental estimates and specifications. Most of the argument revolved around the department's reassessment of estimates originally prepared by provincial engineers. Engineer-in-chief, John Carruthers, was singled out for attack. His estimates were described as "startling" and were attributed to his "short stay in the colony" which had "not enabled him to make himself acquainted with the cost of all materials and other things in the colony".⁴⁰ A more serious charge was that he had allowed to be included in the Brogden contracts items never previously considered part of such a contract*. To deal with the latter allegation first—John Carruthers had been an active socialist in England before coming to New Zealand. Throughout his life he was deeply opposed to the capitalist system. So much so that in one pamphlet he wrote: "No other servants of the State, which capitalists simply are, would be tolerated who were so highly paid, and who performed their work so badly . . . The failures they have made would fairly justify the community in trying to do without them. . . ." ⁴¹ It seems unlikely therefore that he would have knowingly allowed his position to be used for the enrichment of any "capitalist": even a fellow countryman. Furthermore the member who accused him showed little understanding of what should or should not be included in an estimate, or of how estimates were determined.

*These items included a sum for management equal to 12½ percent on the contract; contingencies also 12½ percent; and contractor's profit equal to 10 percent. (*NZPD*, Vol. 13, 3 September 1872, p. 59.)

The problem of accurately assessing and estimating the cost of construction work in New Zealand was a very real one, however, and not just because the engineer-in-chief was new to the colony: no one had a thorough knowledge of the country's geography or geology. All the engineers and skilled personnel had been trained in Europe with its mature and predictable land forms. Here it was not possible to apply any general rule for construction over a large area, and in the 1870s and 1880s engineers from England and the Continent had not learnt to cope with the variations*.

As a result much depended on the accuracy of the survey. If the survey was a short one, or preliminary work had already been done on it, then it would be undertaken by a district or resident engineer. For major surveys the Government preferred to contract individuals on the basis of an agreed sum per mile†, although occasionally an appointment would be made to the temporary staff.⁴² Once the area to be surveyed had been determined the surveyor would gather all the information he could about it from local settlers, and in the North Island, from Maoris if they were amenable. The next step was to visually assess the countryside from the highest point available. From this examination an initial route would be determined then followed through on foot. Since virgin bush often covered the whole area this part of the survey could take months. Several such exploratory trips would be made so no possible route was overlooked. The surveyor would present his findings on all practical routes to the engineer-in-chief, and the Minister for a final decision. Even at this stage a new survey could be called for if representations were made to the Minister that a possible route had been neglected. With proximity to railway lines a major factor in property values such representations were frequent from localities bypassed in a survey. Pressure groups sometimes caused the Government to proceed before adequate surveying had been completed. The Minister himself confessed that additional cost had been incurred because work had been started prematurely.⁴³

*A minor example of such lack of knowledge was recounted by R. W. Holmes, then engineer-in-chief, in 1915: "About 35 years ago some work in connection with the erection of the lighthouse on Cape Egmont, Taranaki, came within my province, particularly the conveyance of the materials to the site and the construction of the foundations, in a hostile district, and under armed protection. The conditions did not conduce to much investigation, so a sand was selected, by judgment alone, from the beach nearby, for the concrete. This however, refused to set within the time which could be allowed, although it ultimately extended to several weeks. Some coarser sand was afterwards obtained from the same beach, a couple of miles further south, which made concrete which set in normal time. Since then similar experiences have occurred in various places around Mt. Egmont, but in an erratic way." (*New Zealand Society of Civil Engineers Proceedings 1914-15*, Vol. 1, pp. 33-34.)

†John Rochfort carried out extensive surveys for the department in the lower half of the North Island in the 1870s and 1880s. He was initially contracted to survey the Wellington-Manawatu gorge railway line. Details of his contract are as follows:

From	To	Distance (about)	Rate	Amount of Contract
Wellington	Petoni [<i>sic</i>]	6 miles	£12 per mile	£ 72
Petoni [<i>sic</i>]	Cruickshanks	16 miles	£15 per mile	£240
Cruickshanks	Featherston	37 miles	£20 per mile	£740
Featherston	Masterton	19 miles	£15 per mile	£285
Masterton	Manawatu Gorge	65 miles	£20 per mile	£650

(*AJHR*, 1871, Vol. 1, D. 6E.) Extracts from Rochfort's reports appear in appendix xiii.

This was equally true of water-race construction. Water races were needed to enable gold to be mined by hydraulic sluicing*. This method requires large quantities of water under high pressure and in the seventies few miners were in a position to undertake the heavy engineering work necessary to provide such water. Unfortunately the euphoric atmosphere which enveloped public works for 5 years after Vogel's statement, blinded several ministries to the harsh realities of gold mining—few areas remained where the quantity of gold to be extracted justified the expense of constructing water races. In 1875, the Public Works Minister had to admit that the Government had made "a grave error in yielding to the pressure which was brought to bear upon it, and entering upon the construction of these races without more reliable data."[†]44

But inadequate knowledge of the countryside was only one difficulty that confronted the department and contractors alike. Even if the estimates were reasonably accurate, contractors costs could greatly increase through delay in obtaining materials. And here again the Public Works Department was directly involved because in the early years it supplied most of the contractors. Orders from the department were placed through the Agent-General stationed in England. Isaac E. Featherston was the first to occupy the post and he seemed incapable of devising an efficient system for obtaining and transporting though it should be said that he faced great difficulties which were not alleviated by the New Zealand Government's failure to understand his position. In February 1873, Edward Richardson, the then Minister of Public Works, had to arrange a cablegram to London stating that not a single order since November 1871 had been completely executed.⁴⁵ Often when the goods did arrive they were in a very poor condition and pilfering was a common problem. Sometimes there was a touch of absurdity to the difficulties: a regular practice was to transport rails in one ship and all the fastenings for those rails in another.⁴⁶ At one stage the shortage of materials was so great that railway construction throughout New Zealand virtually came to a halt. Shipping services were irregular and unreliable. Then, as now, they greatly added to the costs of materials.⁴⁷ The Shaw Savill Company with its virtual monopoly of New Zealand trade was frequently accused of fixing unnecessarily high freight rates and of treating the colony's trade in a cavalier manner.⁴⁸ Materials, for example, were dumped at the port most convenient to the company irrespective of their ultimate destination; in one case stock for Christchurch was unloaded at Nelson. With the country's poor internal communications this meant substantial delay in delivery. The Minister of Public Works was urged to break this stranglehold by arranging for the huge works orders, and the assisted emigrants to be brought to New Zealand in specially chartered vessels[‡]. Unfortunately it was years before a really reliable service was in operation.

*This involves playing powerful jets of water on to erodible faces of shingle and sand, the resulting sludge being washed down into races whose floors are covered with coir matting in which the heavy particles of gold are trapped. (The author is grateful to J. Christie for information on this point.)

[†]In 1880 the Public Works Statement condemned even further the unnecessary construction of water races: "... the expenditure upon water races does not appear to have produced the large benefits which might naturally have been expected from it. None of the companies subsidised by Government have been a success, and in most cases the undertakings have been abandoned. The total expenditure and liabilities upon water races upon goldfields to 31 March amounted to £441,633; of this amount £42,329 gives no return whatever. Works which have cost £86,485 have been handed over to local bodies; while from those races which are comparatively successful, viz, the Charleston, Nelson Creek, Waimea, and Mount Ida races, costing £312,819, the yearly return represents only about 1 per cent." (*AJHR*, 1880, Vol. I, E. 1, p. iv.)

[‡]The Secretary of the Auckland Chamber of Commerce for example, wrote to the Minister in 1873 alleging that the renewal of Shaw Savill's contract would be highly prejudicial to the colony. (N.A. W2/2, 1873/343.)

With routes, and therefore specifications, plans, and estimates frequently subject to alteration, and materials to delay, it was inevitable that relations between the contractors and the Public Works Department were often strained. The situation was further aggravated because there was no independent machinery for resolution of the differences between the two or for renegotiation of contract. Consequently there was a flood of petitions to Parliament from contractors who felt they had been harshly treated by the department. Up to the end of the 1876 session the Petitions Committee had recommended in favour of the contractor in about one-third of the cases presented*. However, what little evidence there is available suggests that the failure of many private contractors to fulfill their obligations in these early years was as much due to the Government's policy (with the notable exception of the deals with Brogden and Sons) of accepting the lowest tender regardless of other factors such as ability and experience, as it was to uncertain information about the job to be carried out.

One problem that contractors and the department had in common was insufficient staff—both skilled and unskilled. In the Public Works statement for 1874 the Minister said that there had been “no period during the year when the staff was sufficient to meet the requirements of the department. . . . Very serious difficulty has been found in procuring Engineers who have had experience in railway surveying and construction. . . . Many works have been retarded for want of Engineers, and, I regret to say, in one or two instances it would have been better to have waited longer rather than employ those whom we did employ”.⁴⁹ The department tried to overcome the shortage by employing and training a large number of engineering cadets. But this did little to relieve the immediate situation, and an emergency recruitment scheme was launched in England. While the economy boomed and the public works programme expanded, the officers of the department were faced with an enormous workload. The Minister acknowledged that Carruthers and Blackett, to mention only two of the staff, had “done an amount of work which few officers of any Government are called upon to do, and each of them has more than once . . . been laid up from overwork.”⁵⁰ The shortage of engineers was bad enough but worse was the lack of men qualified to manage the railways once they were working. The Superintending Engineer for Constructed Railways asked the Agent-General to arrange for suitable immigrants:

“They should be thoroughly practical mechanics, who not only know when work is properly done, but are able to show how to do it. They should be gentlemen of education, writing a good hand, and conversant with accounts. . . . As the managers will be so far away in most cases, and will have so much responsibility, it is necessary that they should be men of undoubted respectability and sobriety.”⁵¹

*Two examples:

“The petitioner [Joseph Taylor] prays that relief be afforded him in the matter of excessive penalties imposed on him for non-performance of his contract within the stipulated time; such non-performance being mainly caused by delays occasioned by the Public Works Department, and alterations made from the original contract.” The Committee recommended that a portion of the penalty should be remitted. (*AJHR*, 1876, Vol. II, 1. 6, p. 31.)

“The petitioners [Collie, Scott, and Wilkinson] state that in January 1874 they entered into a contract with the Government, known as the Summit Contract of the Wellington and Master-ton Railway. That during the progress of the work certain extensive alterations from the original contract became necessary; and casualties happened from causes over which they could have no control. Owing to these circumstances they suffered heavy losses, and became unable to meet their engagements. They pray for relief.” The committee found that “the question to be decided is, whether the colony is to compensate individuals for loss sustained on account of undertaking public works at a price that is not remunerative. The committee do not consider that the colony is responsible for losses so sustained. With respect to this special case: the committee find that the petitioners carried out their work in a satis-

Continued on p. 24

Continued from p. 23

factory manner in the face of certain loss, but as the Government has already given all possible aid and consideration, the committee cannot recommend special compensation for loss so sustained". (*AJHR*, 1878, Vol. II, I. 2, No. 296, p. 22.)

Given the subsequent criticism of the running of the railways one can only assume that such appropriate attributes were seldom combined in one person*.

The situation was equally serious for unskilled labour. In 1872, as Minister of Works, J. D. Ormond circularised the provincial superintendents for their opinions on the introduction of Chinese labour:

"Having in view the large demand for labour caused by the railway and other public works now being undertaken in the Colony, and the difficulty experienced in inducing a sufficient European immigration to supply that demand, the expediency of allowing railway contractors to employ Chinese labour to a limited extent has been suggested."⁵²

Ormond emphasised that the situation was so serious that unless "every available means of obtaining labour be temporarily adopted . . . great difficulty and vexatious delays will be experienced in the execution of railways and other important works".⁵³ The general response was hostile, though the Wellington and Taranaki superintendents allowed that a limited number of "the Mongolian race" would probably do no harm. The only positive answer came from Auckland, which pointed out that there was "no good reason" why they should not be introduced, particularly as "the evidence taken by the Chinese Immigration Committee last session shows the Chinese to be an industrious, frugal, hard-working, orderly body of men. . . ." ⁵⁴ Nothing was done, however, and a year later the labour shortage was still desperate.

New engineer-in-chief Carruthers warned that "unless a very large immigration takes place it will be quite impossible to carry out the wishes of the Government and finish the railways within the times proposed".⁵⁵ He blamed the continuing prosperity for the situation. "The colony is now in so prosperous a state", he believed, "that employment for all the available working men would be found even if no public works were going on."⁵⁶ Of course scarcity of labour forced up wages and therefore costs of construction generally. Where public works were undertaken far from population centres primitive conditions and lack of amenities contributed to the problems. It was all very well to direct labour and assisted immigrants to particular areas but in New Zealand in the 1870s it was almost impossible to keep them there†. Fortunately there were two other sources of labour available to the department—the armed constabulary and the Maori population. Neither was trained in the specialised skills of railway building but with departmental supervision both were active in roadmaking in the North Island. It was Government policy to use them whenever practical—and shortage of other labour was not the only reason.

As the land wars of the sixties came to an end there was little to occupy an armed constabulary. However, with some guerilla outbreaks in the early

*In 1883 the problem of qualified staff still existed. The General Manager of Working Railways, J. P. Maxwell, bemoaned particularly the lack of station masters: "A common error prevails outside the service that any sort of person who has failed in other pursuits, or whose age or infirmities unfit him for active life, can be made a stationmaster. On the contrary, if the public services are to be satisfactorily performed, good training, integrity, ability, and activity are needed." (*AJHR*, 1883, Vol. II, D. 1, appendix L, p. 70.)

†As part of the firm's contract with the New Zealand Government, Brogden's imported navvies to work on their lines. However, such was the rate of desertion and the difficulties of ever tracing the deserters in New Zealand, that the firm petitioned Parliament for compensation for the expense of bringing the men over. (*AJHR*, 1876, Vol. II, I. 6, p. 30.)



Maoris working on the road from Galatea to Ahikereu. *Crompton-Smith donation. Turnbull Library.*

seventies Maori-Pakeha relations were still considered too unsettled to disband the force. Peace and boredom are the bane of the military and the armed constabulary was no exception. Public works apparently saved it from degenerating into an inefficient and incompetent force. The forces commander reported at the end of 1871 that the policy of “keeping the officers and men constantly and usefully employed on road and other works has been productive of the best effects, both as regards the diminution of crime, and the health, vigor, and activity of the men, who by being thus inured to constant active employment, are prepared, if called upon suddenly to take the field”.⁵⁷ To encourage members of the constabulary who found working on the roads less acceptable than military duties a system of rewards and merits was instituted—“energy and talent displayed on roadworks” was to be recognised in exactly the same way as distinguished conduct on the battlefield.⁵⁸

The zeal and diligence of the men did not always compensate for their lack of experience. The engineer in charge of Tauranga district felt compelled to write to head office in January 1871 urging that he be allowed to appoint a permanent inspector to supervise the force’s work in the Opotiki area. He

said he had found several defects which it was too late to rectify.⁵⁹ Faulty work was not always due to the inexperience of the soldiers. Inspector Tuke of the Taranaki district noted that his bridge building party had had to contend with "many unforeseen difficulties. I should here mention that the piles of the Urenui Bridge, which sunk some inches, and were redriven under the direction and superintendence of the district engineer, have again sunk owing to some peculiarity in the strata, showing conclusively that no blame could attach to the constabulary work in the first instance".⁶⁰ As the seventies progressed the armed constabulary became more and more involved in public works. In 1876 the commissioner of the force in his annual report stated that "the number of men at some of the posts is very much reduced, in consequence of the numerous parties employed in making and repairing roads and bridges, over one-third of the force being so engaged"*.

In 1877 the annual course of musketry had to be suspended "in consequence of all men of the Force who could possibly be spared from station duties having been employed during the past year on road works in the armed constabulary districts".⁶¹ One great advantage of employing constabulary on the roads was the marked reduction in costs because the men received no pay bonus for this extra work.⁶² In the early seventies, at least, the constabulary and the Maoris provided the majority of the labour force on North Island roads.

Supervising the Maoris was difficult in the extreme. In the decade 1870-80 the entire question of Maori affairs was delicate and complex. Military confrontation was waning but the problem of land acquisition, at least from the European point of view, was not wholly resolved, the policy of extensive confiscation notwithstanding.⁶³ From its inception the Public Works Department was involved in surveying Maori land for road and railway, in negotiating for its purchase, and in organising Maori work gangs. In this aspect of its operations the Public Works Department worked in close liaison with the Native Department† and a report from an officer of the latter department is reproduced here in full for it admirably describes the activities which occupied early engineers and surveyors throughout the North Island.

"Civil Commissioner's Office, Auckland, 12th June, 1871.

Sir,—

I have the honour to furnish, for the information of the Hon. the Native Minister, a full report of my negotiations with the Natives for the construction of that portion of the main line of road to Taupo lying between Tauranga and the western side of Rotorua Lake, and known by the Natives as the Mangorewa Forest Road.

The first difficulty with which I had to contend was the apparent reluctance of the Native owners of the soil to break through their traditional prejudices in regard to this particular track. In early days this belt of forest was the scene of several bloody encounters between the Rotorua and Tauranga

*At the time the force totalled 676 officers and men. (*AJHR*, 1876, H. 16, p. 1.)

†Maori land purchase for public works was transferred completely from the Public Works Department to the Native Department in 1873. (*AJHR*, 1874, Vol. I, E. 3, p. 11.)

Natives, in almost every instance with advantage to the attacking party, from the facility with which they could advance unperceived by their unsuspecting foes. These ambushades, massacres, and 'kohurus' were so frequent, and so terrible in their results, that the perpetrators themselves became alarmed.

A meeting was, however, arranged between the contending parties, and a solemn compact entered into by the chiefs and 'Tohungas' of the respective tribes, declaring that thenceforward no hostile party should pass over the Mangorewa Stream to attack the other, under the pains and penalties of the displeasure of the gods. Two large totara trees, standing on either side of the Mangorewa Valley, are pointed out as the witnesses to this treaty, and have served to keep succeeding generations in mind of the engagements made by their ancestors. It is said that this treaty has been religiously kept.

The Tauranga natives would not allow Te Whaharoa to pass along that road to attack Rotorua, and the loss sustained by Colonel Fraser's mixed force of Europeans and Arawas, last year, is attributed to the violation of this tapu.

Then again, most of the Native owners of the soil (Ngatirangiwewehi) have been hostile to the Government, and have been staunch supporters of the Waikato king party. The severe handling they got from our forces at Tapapa last year on the one hand, and the non-intervention in their behalf of the king party on the other, decided them in making their submission. This was certainly a strong point in our favour, but it must be borne in mind that they should not shake off in a day the theories they have been schooled in for the last twelve years. The making of this Mangorewa Forest Road was urged as a test of their sincerity.

After a great deal of argument, in which the chiefs wished to show the great advantages the Europeans would derive from having the road made,—and I, on the other hand, having pointed out the great benefit they would reap from making their settlement, instead of being as at present the most distant, the nearest, Arawa village to a good sea port, as well as throwing open their lands, which are of good soil, to beneficial occupation by Europeans,—I at last got them to yield, so far as to give a hesitating consent to allow the survey of the line to be made. The question of the remuneration for forming the road was discussed, but, as I had no authority to do so, I did not close with them, but a certain rate was named and forwarded for the approval of the Government. This was the position of the matter at the beginning of last winter.

During the winter, Mr Turner, the now Resident Engineer in connection with the Public Works Department, with great perseverance forced through the survey, in spite of a wet and severe season and the obstacles raised by the most trying of all trying Arawa Tribes. I arranged a meeting with the

Ngatirangiwehehi and Ngatikereru Tribes, at Te Awahou (Puhirua), for the 8th of March last. Mr. Turner accompanied me. On the 9th the korero commenced, and I soon found that the lapse of time had produced a fruitful crop of objections, many of them most frivolous and absurd. These, and the extravagant demands made, so disgusted me that I very nearly lost all patience. I got up to depart. This had the desired effect, and they begged me to remain till they had discussed the matter amongst themselves. While this discussion was going on I was visited by the principal chief, who requested to be privately informed of my ultimatum; I told him, knowing that every word I said would be carried to the meeting.

In the evening I was sent for to the whare runanga, and I was asked my terms. I told them; and, after some discussion as to details, the following was agreed upon:—

1. The Natives to fell the bush one chain wide, and form road eighteen feet.
2. Natives to build all bridges except three, and the Government to find all necessary ironwork for the same.
3. The three bridges excepted to be built by Government, the Natives allowing necessary timber to be taken from the forest without charge.
4. The formation of road through Mangorewa Valley to be an open question, as there was a great deal of stone.
5. The Government to find pick-axes, crowbars, cross-cut saws, and tackle, if necessary.
6. For this work they would get at the rate of £200 per mile, and to be paid 80 per cent. as work advanced and was approved of.
7. The Government to give them assistance in preventing trespass by Europeans in the pigeon season (from 1st March to 1st August).
8. Work to commence as soon as they returned from Ohiwa.

After my return to Tauranga, I assembled the Natives interested on the Tauranga side of Mangorewa Forest. I told them that I could only repeat to them the arrangements I had made with the Ngatirangiwehehi and Ngatikereru. They directly replied that every hapu was for itself: that if they succeeded in getting more advantageous terms than the Ngatirangiwehehi, no one could complain. Thereupon commenced a long and tedious haggling, but I would not make the least concession.

The meeting then broke up, but I gave them to understand that if they did not come to terms soon, I should feel myself at liberty to arrange with others, either European or Native.

Shortly after this, Mr. Jordan, the person who had contracted to form the road between Waioroi and Oropi, called upon me, and asked if I had any objection to his making arrangements with the Natives, as he had been given to understand they were willing that he should do so. I replied that

there could be no objection, provided he did not exceed the amount at which the work had been offered.

Mr. Jordan succeeded, in two or three days, in completing his arrangements, and stated his willingness to undertake the work at £200 per mile, provided the bridges of the whole line (including the three excepted from the agreement with the Ngatirangiwewehi on the Rotorua side of the forest) were let out to him for construction. After exchanging telegrams, the Hon. the Premier was pleased to give his assent to the arrangements made.

Some time after this, the Tauranga Natives, upon reflection, thought that they had not made the best bargain possible for themselves, and got up a string of objections and difficulties which *were* to arise between themselves and the contractors; but, after an explanation from the contractor, I was satisfied that he intended carrying out his part of the agreement, and I told the Natives that I should hold them to theirs. Seeing this, and having full explanation from their employer, they agreed to go to work at once. This delay is to be regretted, inasmuch as one month of good fine weather has been lost.

* * * * *

I have, &c.,
H. T. Clarke,
Civil Commissioner.

The Under Secretary, Native Department,
Wellington.”⁶⁴

Although Vogel had stated that the primary purpose of his public works scheme was settlement and colonisation, in the North Island at least, its peace-keeping potential was regarded as equally important. Opening up the country would facilitate troop movements, deprive hostile Maoris of retreat sanctuaries inaccessible to Europeans, and by encouraging European settlement tip the numerical scale against the indigenous population. To achieve these objectives the department’s roading programme concentrated on opening up the interior of the North Island from north and south through Taupo*. Most of the proposed roads ran through Maori lands and protracted negotiations for the acquisition of land were frequent†. Usually the Maoris were reluctant to allow a road—the symbol of white domination—to go through. Right through the seventies there were reports from engineers of work restricted because of Maori opposition: “Tauranga and Tapapa Road—The Natives still resist the extension of this road.”⁶⁵ “Ohineroa

*The proposed routes were: Tauranga to Taupo; Taupo to Napier; and a line connecting the East and West Coasts through Seventy-Mile Bush. (*AJHR*, 1871, Vol. I, B. 2A, p. 3.)

†In the department’s first annual report Gisborne commented on these negotiations: “Those who have any acquaintance with the Maori character must know that the Natives regard time as of little consequence, and that in negotiating with them it is often the more haste the less speed.” (*AJHR*, 1871, Vol. I, B. 2A, p. 3.)

Horse Road—the Natives have maintained their opposition and no work has been done.”⁶⁶ Both of these are typical extracts from the 1874 reports of the department’s district engineers.* In a few cases road work was held up while competing tribes vied for the right to have the road through their land.⁶⁷ But the common response was one of suspicion and opposition.

This was a period of painful readjustment for the Maori and responses to the now inevitable European domination differed from area to area. The staff of the Public Works Department became important agents in the re-orientation of Maori society to a life style acceptable to the European. Government policy was not simply to open up Maori land for the Europeans but to use the Maori whenever possible in the construction of roads and railways. Hard work, it seemed, had saved the armed constabulary from indolence and petty crime—it was designed to have an even more salutary effect on the Maoris: “The constant use of the pick and shovel will gradually wean them from their ancestral warlike tastes”.⁶⁸ At least that was the view of Lieutenant-Colonel St. John, and he did not hold it alone. Gisborne, in recommending the Vogel scheme to the Legislative Council, had argued that “an essential element in the restoration and maintenance of peace in this Island, will be the employment of the Natives themselves for this purpose, as great power will thereby be given to restrain them from falling into evil habits or joining hostile tribes who may wish to attack the Europeans”.⁶⁹ Providing the Maoris with work was one thing, persuading them to do it was quite a different matter. In the first half of the seventies it was rare for an engineer to report that the Maoris in his district were “working cheerfully”.⁷⁰ Much more common was the complaint that work was progressing “very slowly, as the Natives here are very dilatory.”⁷¹ In 1875 the assistant engineer-in-chief felt compelled to report that “in the Native districts very much more work might have been done had it been possible to induce the Natives to fulfil contracts already undertaken, or to engage in any new work prepared for their acceptance”.⁷² There were, of course, exceptions. A typical one concerned a group of Maoris at Raglan. Their chief wrote to the Government seeking the contract to make the road to Raglan. His letter read in part “this is a work which will help to keep my people good”.⁷³ And some Public Works Department staff thought that was just what they were doing. The engineer in charge of roads in North Auckland, J. J. Wilson, was one. In his report for 1874, Blackett noted that “Mr. Wilson reports that he notices a general improvement in the Native people; that they are acquiring habits of industry, and appear to appreciate better than formerly the value of time, and that they generally clothe themselves better since they have been able to earn money by roadwork.” There was one slight drawback. Their contact with Europeans had apparently “increased their love of gain†, and they are always on the alert to obtain some advantage in

*Similar examples can be quoted from other years, e.g., *AJHR*, 1873, E. 2B, pp. 1–6; *ibid*, 1875, E. 3, p. 47.

†Complaints of Maori “greed”, or hard bargaining, were common. The following are two further examples:

“Whakatane and Te Teko Horse Road—13 miles. Endeavours were made to arrange with the Natives for the construction of this road, but without success, their demands being in excess of the value of the work, and it was therefore commenced by the Native Contingent. To this, however, the Natives objected, and the work has since been stopped.” (*AJHR*, 1873, Vol. 2, E. 2B, p. 5.)

“Matata and Whakatane Horse Road—A deviation is required at Otamarakau, but the Natives still ask too much for their labour.” (*AJHR*, 1874, Vol. 1, E. 3, p. 43.)

their work, or to sell at high rates the timber needed for the bridges and culverts.”⁷⁴ Native Minister McLean had initially maintained that using Maoris was up to 50 percent cheaper than contractors and European labourers. Something had obviously gone wrong!

As the department grew, an increasing amount of paperwork was demanded of the staff. Not only were there annual reports to be written but also quarterly, monthly, and weekly returns of various types to be made*. The administrative section of head office tried right through the seventies to establish a rational system of communication between Wellington and the districts—apparently with some difficulty. While engineers grumbled about having to fill in forms at all and did their best to avoid them†, head office staff complained about the way they were done; repeated instructions issued:

“The particular attention of Engineers is called to the instructions repeatedly issued that no plan or map shall be sent to this office without a heading or without having the scale both written and drawn.

There is a good deal of time lost in this office in finding out the scale: in the case of maps especially this can only be done by hunting up other maps with which to compare them and in this way many hours of valuable time are repeatedly sacrificed.

It is no part of my duty nor that of the draftsmen in this office to do the work for which the district draftsmen are paid, and I trust Engineers will visit with severity any future omissions, . . .”⁷⁵

In another case engineers were told that “considerable inconvenience results from the practice which many officers corresponding with the head office make of putting no heading to their communications”.⁷⁶ It apparently took the Public Works Department’s first engineers some time to learn that Government departments required far more than technical proficiency from their professional staff.

In spite of its problems, in those first 5 years, Public Works was the envy of other departments. William Clayton, the Colonial Architect, was attached to the Colonial Secretary’s office. But he admired the enthusiastic and energetic atmosphere surrounding the Public Works Department. He decided his office would greatly benefit from being attached to it. Quite possibly he was motivated by the increasing insecurity of his own position. During the supply debate of 1871 several members had suggested dispensing with his services.⁷⁷ One member had allowed somewhat condescendingly that the “general design of Government House, and the manner in which that building had been constructed, showed that that gentleman possessed considerable architectural skill”.⁷⁸ Nevertheless, he maintained that the time had arrived when they “could fairly and properly get rid of the item for his salary”.⁷⁹ In his shortsightedness he failed to realise that an extensive

*As well as regular returns and reports, Parliament frequently asked for specific figures which necessitated extra work. And in one instance the “Home” government called for a complete description of all railways including:

“A complete itinerary of their course.

Kind of country they traverse with its resources, passes, tunnels, cuttings, embankments, inclines, bridges, towns and villages through or near which they pass, with resources of the latter in food, water, and shelter for men and horses.

Branch lines and inter-communication with other lines of communication.

Military positions.

Convenient halting places and camping ground on the line, extent of each and whether it fulfils all the conditions concerning the health and the wants of the troops; also the distance from neighbouring camping grounds.” (N.A. W4 Circular dated 25 September 1876.)

†One circular from Engineer - in - Chief Carruthers read:

“I have to call your attention to my circular requesting a statement to be furnished of the number and position of sleeper contracts up to 30th June last.

It is now over 3 months since the forms were sent and the statements asked for, and up to the present time they have not been received.

Continued on p. 32

Continued from p. 31

As these returns should have been furnished long ago, and the information is urgently required, be good enough to attend to the matter at once.” (N.A. W4 Circular No. 29/75, 5 November 1875.)

building programme was to become an intrinsic part of public works policy*. Clayton survived the debate and in 1873 his office—Public Domains and Buildings—was transferred to Public Works. For a long time the architectural and engineering sections represented the most significant division in the department’s duties. Being part of the Public Works Department did not instantly solve all Clayton’s problems. In his first report to the Minister of Public Works he complained of rising prices, shortage of labour, and lack of skilled personnel—and in a note that has a modern ring, he commented bitterly that it was worst in Wellington.⁸⁰

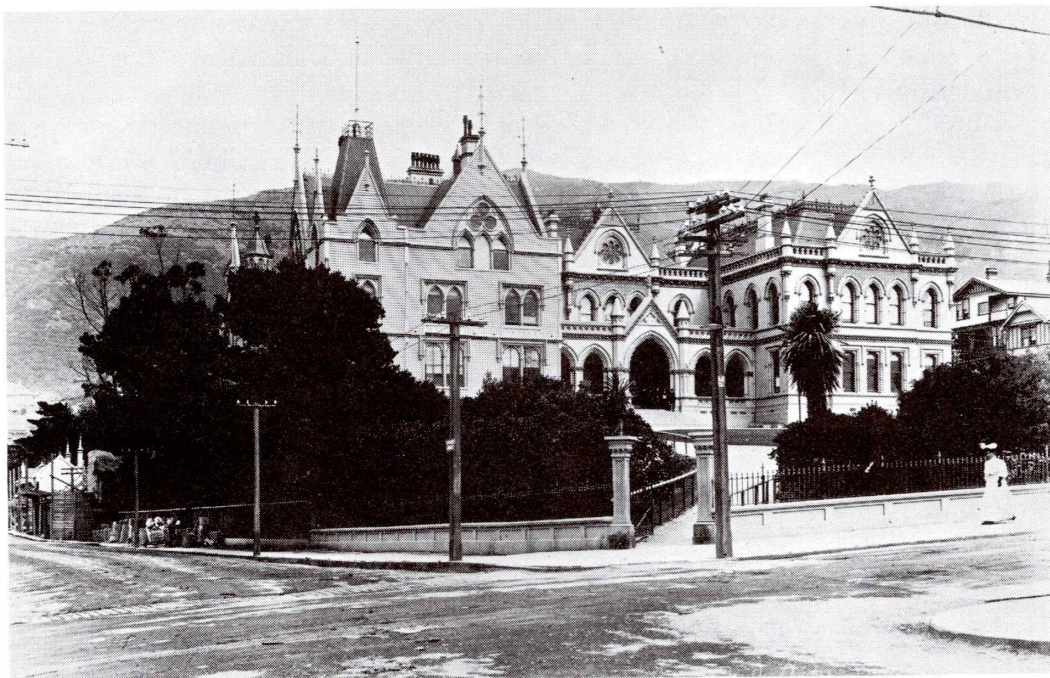


LEFT: Invercargill Post Office. Originally built to serve as departmental offices, the first portion was erected in 1876. The tower and clock were added in the mid nineties. *Ministry of Works.*

BELOW: Government Buildings in Wellington, the “largest wooden structure in the Southern Hemisphere”, the first portion of which was occupied in 1876. *Burton Bros. collection. Turnbull Library.*

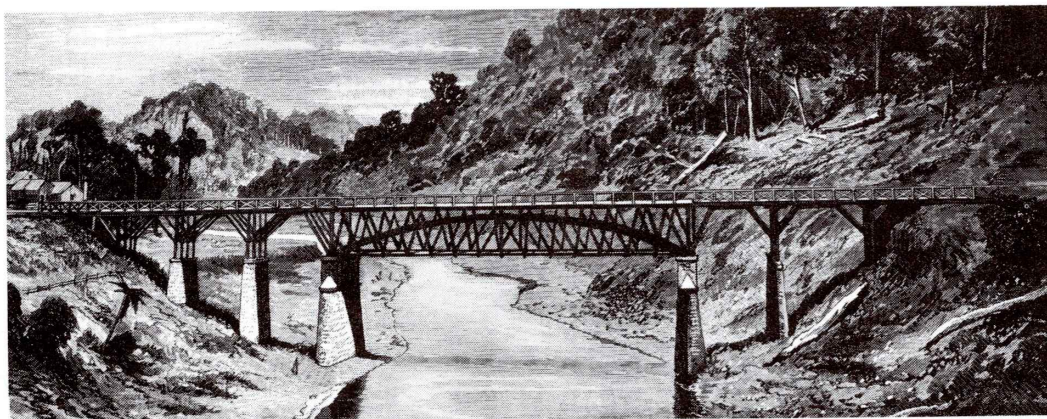


*Another member bitterly opposed to Vogel’s borrowing plans, agreed that there was not much for the architect to do at that moment. But he suggested that the time was coming “when that gentleman would have considerable claims made upon his time and attention in the building of poor-houses for the deluded inhabitants of this country”. (*NZPD*, Vol. 10, 27 September 1871, p. 650.)



Parliament Buildings, Wellington. The left portion, erected in 1873, was burned down in 1907. The right section, built in 1899, is the present General Assembly Library. *Turnbull Library.*

The first 5 years were good ones for the department. It had its problems, both administrative and professional, but it was a lively and vigorous place to work. It seems hard to believe, but just 5 years after the Public Works Department was established railway building reached its peak. Three times more railway mileage was opened in that year than in any subsequent one.⁸¹



The first Upper Manawatu Gorge bridge was built to carry railway as well as road traffic. Completed in 1875, it was in use until the present bridge was opened in 1931. *Illustrated N.Z. Herald by courtesy General Assembly Library.*

The Public Works Department's rapid growth and expansion reflected a New Zealand wide euphoria—a belief that public works were the key to instant utopia. In such a climate, mistakes, when they occurred, were readily attributed to political incompetence or interference. The department escaped serious criticism. Such a situation was unlikely to last. There were signs that times were changing by the end of 1875. The catalyst was the economy. A sentence in the 1876 Financial Statement foreshadowed the department's next 15 years.

“When difficulty in negotiating the balances of the loans became apparent, the Minister for Public Works was asked by the Government to retard for a time the operations of his department”.⁸²

REFERENCES CHAPTER 2

- ¹*NZPD*, Vol. 7, 28 June 1870, p. 115.
- ²*Ibid.*, 8 July 1870, p. 310.
- ³*Ibid.*, Vol. 8, 3 August 1870, p. 285.
- ⁴*Ibid.*, Vol. 7, 7 July 1870, p. 271.
- ⁵*Ibid.*, Vol. 8, 9 August 1870, p. 385.
- ⁶*Ibid.*, p. 386.
- ⁷The Immigration and Public Works Act 1870, Part IX, clauses 91–93.
- ⁸*Ibid.*, clause 93.
- ⁹See organisational charts, appendix III.
- ¹⁰*Appendix to the Journal of the House of Representatives*, (hereafter *AJHR*) 1872, Vol. III, G. 53A.
- ¹¹*Ibid.*
- ¹²This section is based on information from the brief individual biographies in Furkert, F. W., *Early New Zealand Engineers*.
- ¹³*AJHR*, 1871, Vol. I, D. 4, p. 3.
- ¹⁴*NZPD*, Vol. 9, 16 August 1870, p. 34.
- ¹⁵Furkert, p. 135.
- ¹⁶*NZPD*, Vol. 12, 28 August 1872, p. 757.
- ¹⁷*Ibid.*
- ¹⁸*AJHR*, 1875, Vol. I, E. 10, p. 3.
- ¹⁹*Ibid.*
- ²⁰*Ibid.*, 1876, Vol. I, E. 2.
- ²¹See for example *ibid.*, 1875, Vol. I, E. 3, pp. 33–34.
- ²²*Ibid.*, 1871, Vol. I, D. 5, p. 3. See also Blackett's map which follows p. 15.
- ²³See for example National Archives (hereafter N.A.), W2/1, 1872/971, 6 April.
- ²⁴N.A. W4 Middle Island Circular No. 16/79, 8 December 1879.
- ²⁵Furkert, p. 273.
- ²⁶*AJHR*, 1872, Vol. I, B. 2A, p. 18.
- ²⁷*NZPD*, Vol. 9, 26 August 1870, p. 332.
- ²⁸*Ibid.*, Vol. 12, 14 August 1872, p. 480.
- ²⁹*Ibid.*, pp. 479–480.
- ³⁰*Ibid.*, Vol. 8, 9 August 1870, p. 394.
- ³¹The Immigration and Public Works Act 1870, clause 91.
- ³²*NZPD*, Vol. 9, 16 August 1870, pp. 35–36.
- ³³*Ibid.*, 24 August 1870, p. 227.
- ³⁴*AJHR*, 1871, Vol. I, B. 2A, p. 8.
- ³⁵*NZPD*, Vol. 11, 27 October 1871, p. 623.
- ³⁶*Ibid.*, 15 November 1871, p. 1084.
- ³⁷*New Zealand Society of Civil Engineers Proceedings 1916–17*, Vol. III, Wellington, 1917, p. 34.
- ³⁸*NZPD*, Vol. 12, 22 August 1872, p. 619.
- ³⁹*Ibid.*, 21 August 1872, p. 585; Vol. 13, 3 September 1872, pp. 57–59.
- ⁴⁰*Ibid.*, Vol. 13, 3 September 1872, p. 59.

- ⁴¹Quoted in Roth, H., "The Man Who Built Our Railways", *Public Service Journal*, April 1959.
- ⁴²This section on surveying method is partly based on a passage in Heron, G. W., "The development of railway policy in New Zealand and the growth of the North Island railway system before 1908", M.A. thesis, Univ. N.Z., Auck. College, 1946, p. 10.
- ⁴³*AJHR*, 1875, Vol. I, E. 3, p. 3.
- ⁴⁴*Ibid.*, p. 9.
- ⁴⁵*Ibid.*, 1873, Vol. II, E. 3, p. 5, No. 13.
- ⁴⁶*Ibid.*, p. 3, No. 6.
- ⁴⁷*Ibid.*, p. 4, No. 11.
- ⁴⁸*Ibid.*, p. 1, No. 1.
- ⁴⁹*Ibid.*, 1874, Vol. I, E. 3, p. 1.
- ⁵⁰*Ibid.*, 1873, Vol. II, E. 1, p. 1.
- ⁵¹*Ibid.*, 1875, Vol. I, E. 1, p. 2.
- ⁵²*Ibid.*, 1872, Vol. II, D. 12, No. 1.
- ⁵³*Ibid.*
- ⁵⁴*Ibid.*, Nos. 2-7.
- ⁵⁵*Ibid.*, 1873, Vol. II, E. 2A, p. 1.
- ⁵⁶*Ibid.*
- ⁵⁷*Ibid.*, 1871, Vol. II, G. 5, p. 3.
- ⁵⁸*Ibid.*, Vol. I, D. 1c, p. 7, No. 9, enclosure 1.
- ⁵⁹*Ibid.*, D. 1, p. 8, No. 8.
- ⁶⁰*Ibid.*, 1876, Vol. II, H. 16, p. 10, enclosure 7 in No. 1.
- ⁶¹*Ibid.*, 1877, Vol. II, H. 11, p. 2.
- ⁶²*Ibid.*, 1876, Vol. I, E. 1, p. 5.
- ⁶³For details see Sorrenson, M. P. K., "The purchase of Maori lands, 1865-1892." M.A. thesis, Univ. of Auckland, 1955.
- ⁶⁴*AJHR*, 1871, Vol. I, D. 1, p. 19, No. 29.
- ⁶⁵*Ibid.*, 1874, Vol. I, E. 3, p. 43.
- ⁶⁶*Ibid.*, p. 44.
- ⁶⁷*Ibid.*, 1871, Vol. I, B. 2A, p. 3.
- ⁶⁸*Ibid.*, D. 1, p. 13.
- ⁶⁹*NZPD*, Vol. 9, 23 August 1870, p. 181.
- ⁷⁰*AJHR*, 1873, Vol. II, E. 2B, p. 2.
- ⁷¹*Ibid.*, 1874, Vol. I, E. 3, p. 46.
- ⁷²*Ibid.*, 1875, Vol. I, E. 3, p. 47.
- ⁷³Letter dated 28 November 1871, from Hetaraka Nero; N.A. W1/1, 1871/2740.
- ⁷⁴*AJHR*, 1874, Vol. I, E. 3, appendix B, p. 40.
- ⁷⁵N.A. W4 Circular No. 21/75, September 1875.
- ⁷⁶*Ibid.*, Circular No. 6/76, February 1876.
- ⁷⁷*NZPD*, Vol. 10, 27 September 1871, pp. 649-651.
- ⁷⁸*Ibid.*, p. 651.
- ⁷⁹*Ibid.*
- ⁸⁰*AJHR*, 1874, Vol. I, E. 3, appendix F, p. 67.
- ⁸¹Furkert, p. 85.
- ⁸²*AJHR*, 1876, Vol. I, B. 2, p. 4.

CHAPTER 3 / *Uncertain Future*

The chapters on New Zealand in J. A. Froude's Oceana (published in 1886) "gave the impression of a country, ruled over by a corrupt government, whose chief industry was public works, and whose soil was useless for agriculture owing to the numerous hot springs that bubbled up in all directions".

Burdon, R. M., *The Life and Times of Sir Julius Vogel*, p. 205.

The Abolition of the Provinces Act 1876 prevented the Public Works Department from complying with the Government directive to restrict its activities. Instead they increased. When the Act came into force the department had to take over all public works previously handled by the provinces. The major items in this category were the working railways in Otago and Canterbury, and provincial roads under construction (or already authorised) throughout the colony. Minister J. D. Ormond allowed in his annual report of 1877 that "the additional work and responsibility thrown upon the Public Works Department by these changes has been very considerable".¹ That was something of an understatement.

The Department was faced not only with extra work in 1876 but also growing discontent at the way the work was being done. Most criticism centred round the operation of the railways. The Public Works Department appointed managers responsible for the day-to-day running of each open line. The local district engineer remained responsible for the track, bridges, and culverts. Nowhere were their respective duties clearly defined. According to the department's critics inefficient and confused administration was the reason for the working railways' failure to pay the interest on the loans raised for their construction. As well as providing an insufficient return on the money invested in them, the railways were also offering allegedly inadequate services. Dissatisfaction throughout the colony was such that between 1876 and 1880 there were two committees, a commission and a Royal Commission concerned with the railways.² The first was really an inter-departmental committee set up by the Minister of Public Works to plan the integration of railways operated by the Government and those managed by the Canterbury and the Otago provincial authorities. Amongst

other things it recommended that the system of block working should be adopted and that all stations should be connected by telegraph.³

The commission, made up of three local members of Parliament, was appointed in January 1877 to inquire into the operation of the railways in the provincial district of Auckland and its findings reflected its composition. They suggested causes for many of the complaints; there was neither the population nor the business to make the railways pay; the lines missed both the most populous districts and the best agricultural land.* What the commission failed to realise or take into account was the extreme difficulty of obtaining qualified staff, experienced and competent to manage operating railways. In 1875 the Superintending Engineer for Constructed Railways, Frank B. Passmore, reported that although he had advertised extensively for "persons capable of undertaking the management of a line of railway", there were only 12 responses and "those were chiefly of a character wholly unsuitable."⁴

A select committee, with J. Evans Brown, member for Ashley, as chairman, was appointed in August 1877. It made a very thorough investigation and in its report produced 22 generally sound recommendations, the principal ones being:

"That it is expedient that the management of the New Zealand railways open for traffic be under separate management to the railways under construction.

That there should be a permanent Commissioner of Railways, who should have the entire responsibility of the management of the practical working of the railways, subject only to the control of the Minister."^{†5}

In view of the specific nature of the second recommendation it is hard to understand the action taken in March and April 1878 when a commissioner of railways was appointed for each island.⁶ Both commissioners were responsible directly to the Minister of Public Works. With a new Government in power it may have been W. J. M. Larnach who engineered the change. He succeeded J. D. Ormond as Minister on 15 October 1877. They were both members of the select committee, which certainly considered this issue as questions on it were put to various witnesses. On 13 September Ormond, as Minister of Public Works, was questioned by the committee. He strongly favoured one general manager for the whole colony, but some questions put by Larnach seem to indicate that the latter held a contrary opinion.⁷ Larnach's period as Minister ceased on 5 March but the planning of the changes was evidently done during his term, as the appointment of Wm. Conyers as Commissioner of Railways for the Middle Island was dated from 1 March.⁶

As mentioned later the establishment of separate organisations for each island applied both to railway operation and to construction, and if Larnach was responsible he left a sorry legacy to the Department.

*The commission, however, failed to acknowledge that population and land quality were only two of the many complex factors, both political and engineering, which determine the final location of a railway line.

It also found that fares and charges were illogical, and noted that between Auckland and Newmarket, Otahuhu and Penrose, fares were in each case 50 percent higher than the comparable bus services. And it added that buses were faster, more frequent, and more comfortable. (*AJHR*, 1877, Vol. I, E. 2A, pp. 2 & 3.)

†The report of the proceedings of the Committee includes one amusing and very revealing piece of evidence concerning the bureaucratic system of requisitioning stores. Mr Conyers, the Superintending Engineer of the Southern Railways was questioned by the Chairman: "What is the modus operandi of obtaining sleepers for the maintenance of the way and rails?" He replied: "Under the present system there are two distinct store departments—one connected with constructed railways, and one belonging to construction, and the whole of the permanent-way materials in store are held by the construction department, so that if one of our gangers on the Canterbury Plains requires rails or sleepers for repairs, he makes out a requisition on his Sub-Inspector; next, the Sub-Inspector requisitions the Inspector; third the Inspector requisitions the Resident Engineer of Constructed Railways;

continued on p. 38.

continued from p. 37.

fourth, the Resident Engineer of Constructed Railways requisitions the Railway Storekeeper; fifth, the Railways Storekeeper requisitions the Public Works Storekeeper; sixth, the Public Works Storekeeper requisitions the Public Works Resident Engineer; seventh, the Public Works Resident Engineer requisitions the Inspector of Stores, Wellington. The next process is as follows:—Eighth, the Inspector of Stores authorizes the Resident Engineer of Public Works; ninth, the Public Works Resident Engineer authorizes the Storekeeper of Public Works; tenth, the Public Works Storekeeper authorizes the Railway Storekeeper; eleventh, the Railway Storekeeper authorizes the Inspector of Public Way; twelfth, the Inspector of Public Way authorizes the Sub-Inspector of Public Way; thirteenth, the Sub-Inspector of Public Way authorizes his ganger. I may mention that the result has been that the gangers take sleepers and rails and put them into the lines without authority; and it cannot be wondered at that they do so.” (*AJHR*, 1877, I. 5, p. 87, question 2185.)

Of necessity, in later years procedure for obtaining supplies became much more streamlined.

While operation of the completed railways was officially separated from the construction organisation with the appointment of the commissioners in March and April 1878, it took some time for the new arrangement to become fully effective. Old habits die hard and in October the Minister advised the under-secretary that he was relieved of the head office charge of the Working Railways Department.⁸ The new department was short of engineers and tended to call on the construction side for assistance. The Public Works Department in the next 2 years tried to define its relationship to the working railways. In 1877 before the appointment of the commissioners a circular had gone out to all relevant staff:

“Duties of Engineers for Construction in regard to lines open for traffic. As there is some doubt as to the duties of Engineers for Construction in regard to lines open for traffic they are informed that it is their duty to go over the line from time to time and see that Bridges, Culverts, Tunnels, and all works involving the stability of the Railway are in good repair—They are not in any way responsible for the state of the Permanent Way or Stations for which the Manager alone is responsible. If any repairs are required to the works under their charge they are to inform the Engineer in Chief. It would save time if the Manager were informed direct, but such information must be given unofficially & only when the Manager prefers so to receive it. The expenditure (except when charged to Construction), will be carried out under the Manager’s directions.”⁹

At the beginning of 1879 somewhat altered instructions were issued. The district and resident engineers were to examine “all foundations, bridges, open culverts, Tunnels, & wharves” and to “inform the Manager in writing of the results of [the] inspection pointing out any matter requiring action”.¹⁰ The railways managers were informed that it was their responsibility to have the “requisite repairs, etc., executed”. The manager could not go ahead with any repairs to “bridges, open culverts, tunnels, and other works of importance involving the stability of the line”¹¹ without a report from the engineer. Hardly a year after this circular was issued the Royal Commission upon the Civil Service, which devoted much attention to the Railways and Public Works Departments, decided that this system resulted in a wholly unnecessary duplication of staff and expenses. It reported that a common siding could not be laid down on a working railway unless there were two engineers present. “One must be called in from the construction department to decide how such an important new work can be executed, and a second must be brought from the maintenance staff to ascertain how it can be connected with the existing line.”¹² Even worse, Public Works and Railway staff frequently disagreed and, said the commission, “the divided and often antagonistic opinions have caused great expense, as well

as delay and confusion".¹³ In fact the process of removing the control of working railways from the Public Works Department seemed to have created some bitterness between the new department and its parent body. The Royal Commission, commenting on relations between the two, noted that "each regards the other as an alien rather than an ally, and there is no evidence, and apparently no possibility, of friendly co-operation for the general good".¹⁴

Obviously there were two problems to be resolved. One concerned the efficient administration of working railways and did not involve the Public Works Department. The other required a clear demarcation of responsibility between the two departments. Various means of administering the Railways Department were tried in the 1880s but no permanent solution had been found by 1890*. However, the question of respective responsibility was easier to solve—ultimately the Public Works Department undertook the construction of all new lines; the Railways took over all maintenance of open ones.

The establishment of a separate department to operate open railway lines was not the most significant administrative change in the Public Works Department in the late 1870s. Far more important was the Government's decision to decentralise public works administration by dispensing with most of the headquarters engineering staff and by creating separate organisations for the North and South Islands. The reasons for the change were never clear, but it was evidently in line with the changes made in setting up the Railway Commissioners. James Macandrew, who succeeded Larnach as Minister of Public Works while the changes were being made, argued that it was in the interests of efficiency and economy. First, he claimed that it was necessary to have an engineer-in-charge for each island because "it was physically impossible for one man to exercise any very minute personal control over the public works in both islands".¹⁵ In fact it was not possible for one man to exercise "any very minute personal control" over the public works in one island, nor has such supervision by one person ever been found particularly useful. The dismissal of the head office staff actually deprived both islands of the supervisory services of the two superintending engineers, whose main task was the inspection of construction work. So if there was evidence of a need for improved professional supervision, simply dividing the department in two was not likely to achieve it. Until 1878 divisions of duty within the Public Works Department had been along professional lines—John Carruthers mainly responsible for railways, John Blackett for roads—an obviously more rational method than simply dividing duties along geographical lines. Macandrew's own attitude was ambiguous for he disclaimed "casting any reflection upon those who have hitherto had the professional overcharge of our public works; if there have been blunders

*In 1880 the administration of working railways was centralised. A general manager with headquarters in Wellington was substituted for the two commissioners. The two Accountants' Departments were amalgamated as were the Stores Departments. The changes were designed to give the Minister more effective control than he had had over the department. (*AJHR*, 1881, Vol. I, D. 1, pp. iii-iv.) Such political control soon fell into disrepute when it had no measurable effect on the railway's efficiency. In 1887 an Act provided for an independent board of management with three commissioners. It was finally established in 1889. The Chief Commissioner was previously the Surveyor-General, the second the late General Manager and the third the late Accountant. So there was little effective change in management, though the commissioners' powers were extensive. This system was short lived.

they have been chiefly incidental to circumstances, and to the nature of things—in my belief they have been more political than professional”.¹⁶

His second stated reason for dividing the department was the “considerable saving” that would be effected in head office staff.¹⁷ Some engineers were entitled to 12 months notice of termination of service, so it was to be a year before any reduction would show in the estimates. Then it would amount to £3,000 a year on departmental salaries. The engineer-in-chief’s salary amounted to one-third of this which suggests there was little real pruning of staff or reorganisation of offices. Only 2 years later the Royal Commission on the Civil Service thought the department grossly overstaffed.¹² Clearly neither efficiency nor economy was served by the change.

Macandrew’s critics accused him of rather more devious motives. They claimed that the division of control was the forerunner of some “deep and sinister design on the part of some person or persons, and that it is studiously intended to lead up to the political separation of the two Islands.”¹⁸ Charges which, of course, the Minister vigorously denied.

Effecting the reorganisation created certain problems. The post of engineer-in-chief was to be abolished—but what was to be done with John Carruthers?



William Newsham Blair (1841–91), appointed Engineer-in-Chief and Under-Secretary 31 May 1890. *Ministry of Works*.

The Government offered him the position of engineer-in-charge of the North Island. The offer represented a decline in salary and status. He turned it down.¹⁹ A week and a half later the Minister ordered him to hand over his responsibilities to William Blair and John Blackett, who had been appointed to the South Island and North Island respectively.²⁰ It was a month before Carruthers complied.²¹ This delay suggests he seriously questioned the wisdom of the reorganisation but he was unable to alter the Government's decision. By the terms of his employment Carruthers was entitled to 12 months notice and during that time he acted in a consultant capacity, advising the Government on specific projects, and dealing with problems that dated from his term of office*. On his return to England in 1879 he became consulting engineer to the New Zealand Government.

The loss of a man of Carruthers' calibre was not the only disadvantage of the new system. Hardly a year had elapsed before Parliamentary representatives from Nelson and Marlborough were complaining about the inconvenience of administering public works from Dunedin instead of Wellington.

Dr J. Henry, member for Buller, complained that if "any information were wanted, weeks often elapsed before it could be obtained." The member for Motueka wanted the Nelson and Marlborough Districts transferred to the Northern Public Works office—and not just because geographically it was more logical—he believed the district he represented would profit from the transfer because "the Engineer in Charge of the North Island had great local knowledge of the Nelson District, while Mr. Blair, the Engineer in Charge of the South Island, had no personal knowledge of it whatever, although it was under his supervision".²² The implication was clear—an engineer with some previous association with an area would ensure a greater programme of public works for it†. In replying to these criticisms Macandrew admitted that public works in the districts concerned might be more adequately administered from Wellington than Dunedin, but insisted that the "experiment" be allowed to continue because it was too early to judge the effect of the separation of the department.²³ In fact the experiment continued until 1884.

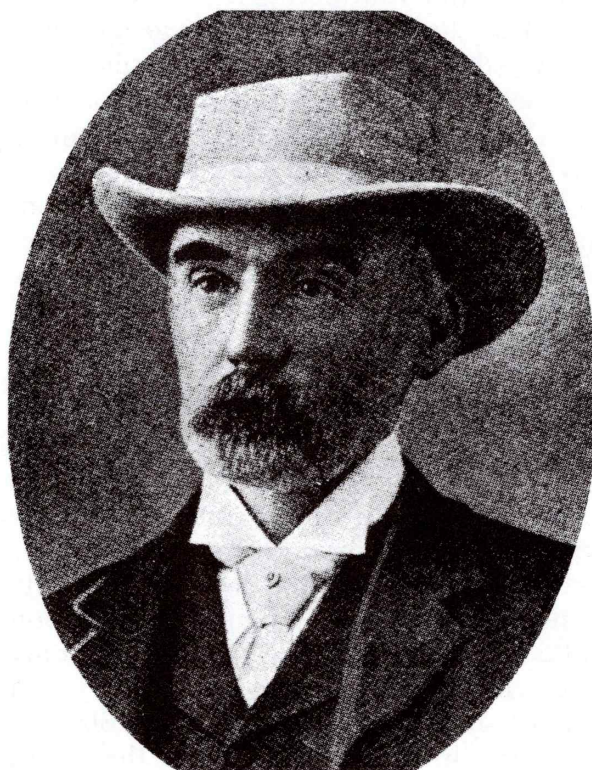
In practice it was not possible to have two completely autonomous departments and a head office responsible for both islands was retained in Wellington with the under-secretary in charge. With a man of John Carruthers' stature as professional head there had been no question as to who effectively ran the department. But with professional responsibilities divided the position of Under-Secretary was considerably strengthened, for he was the only person in the department concerned with all its activities and being based in Wellington he had easiest access to the Minister. (Even John Blackett was away a good deal of the time supervising work throughout the North

*For example, in December 1878, the under-secretary notified Carruthers that the Brogden correspondence was ready for his perusal. The Brogdens, dissatisfied with certain aspects of their contracts, were contemplating court action. (N.A. W2, 78/4608, 2 December.)

†John Blackett, engineer-in-charge of the North Island, had been provincial engineer for Nelson before taking up an appointment with the Central Government in 1870.

Island.) The under-secretary was now in a position to assume effective as well as theoretical power over the professional heads. John Knowles,* the first permanent under-secretary and his temporary successor Charles Benzoni,* were administrators with no pretensions to engineering knowledge so they presented no threat to the department's chief engineers. But in 1883 an engineer who understood the potential power of the position was appointed under-secretary. He was C. Y. O'Connor, previously district engineer for Westland, at the time inspecting engineer, Dunedin, and deputy to the engineer-in-charge, W. N. Blair, who had been his immediate superior since the department was divided in 1878. Unfortunately the files which might explain why an engineer was appointed to a top administrative post at this time have long been lost.

John Knowles retired from the post in March 1883,²⁴ and C. T. Benzoni who was then assistant under-secretary immediately became acting under-secretary.²⁵ About the time of Knowles' retirement the Minister of Public Works received a letter from one C. D. Irvine, who had been employed as a draftsman in the department in 1881, suggesting "that great advantage would accrue by appointing a civil engineer as Under-Secretary for Public Works".²⁶



*For brief biography see p. 280.

Charles Yelverton O'Connor (1843-1902), Under-Secretary of Public Works 1883 to 1890. *Ministry of Works*.

What prompted the letter is unknown; possibly dislike of Benzoni who was Knowles' logical successor. More probably it was indicative of the feeling of a particular section of the department at the time. Meanwhile O'Connor was still in the South Island. In 1881 he had applied for leave of absence for 1 year on full pay or 2 years on half pay.²⁷ No action was taken on his request until January 1883 when Blair, his superior, recommended that he receive £230 for his passage "home" and a travelling allowance.²⁸ Given the subsequent relationship between the two men, it is possible that Blair knew of O'Connor's aspirations to the under-secretaryship and hoped to prevent his appointment by ensuring that he was out of the country. O'Connor, however, decided not to take the trip and his appointment by the Governor as under-secretary for Public Works was gazetted as from 17 November 1883.²⁹ A year later Benzoni, who had reverted to the post of assistant under-secretary, applied for 6 months' leave of absence.³⁰ This was granted and almost immediately there followed a letter notifying him that his services were to be dispensed with after the expiration of his leave of absence.³¹ It is unlikely that his forced retirement was part of a staffing economy drive because only a few months later H. J. H. Blow* applied for and was appointed to the post.³²

The division of the Public Works Department survived through four changes of Ministry, then in 1884 the reconstituted Atkinson Government suggested that a single central department be reconstituted. The reasons for the decision are not clear. Atkinson was in the process of setting up an elaborate system of local bodies to carry out public works which would presumably lessen the need for the type of local supervision by the Public Works Department that had prompted decentralisation. In March a memo was issued with notification of the impending abolition of the Middle Island office and the appointment of Blackett as engineer-in-chief and Blair as his deputy.³³ The change actually took some months to effect and it was not until August that warrants were issued recreating the two offices and appointing Blackett and Blair to them.³⁴ At this stage the two men were confronted with O'Connor, both administratively and technically competent, the *de facto* head of the department, and yet professionally their junior. There is no evidence that Blackett found the position difficult to handle. His reputation in New Zealand was high and of long standing, he apparently felt secure in his position. He had the advantage of being 20 years older than O'Connor, so his seniority at least was established. But Blair was his contemporary—only 2 years separated them in age.

In March 1889 Blackett resigned from the post of engineer-in-chief to become consulting engineer to the New Zealand Government in England.³⁵ For a time no one was appointed to the position, partly because the department was about to be abolished, and partly because of an apparent struggle

*For brief biography see p. 281.

between Blair and O'Connor. The problem of who was to control the department was resolved, though it turned out to be only temporarily, with the offer to O'Connor of the post of marine engineer for New Zealand.³⁶ O'Connor's attitude to the transfer was made very clear in a letter of acceptance he wrote to the Minister:

"Sir,

I have the honour to acknowledge the receipt of your letter of 10th instant, releasing me from the duties of Under Secretary for Public Works, as from 31st inst. and intimating that Mr Blair will take over the said duties, in conjunction with those of Engineer in Chief; also offering me the appointment of Marine Engineer for the Colony, with special control of the Westport and Greymouth Harbours, at a salary of Eight hundred pounds per annum to take date from 31st inst.: and intimated that in the event of Mr Blackett retiring from the position of Consulting Engineer for the Colony (which you understand is not improbable at an early date) it is intended to offer me that position; also intimating that, had Mr Blair not been selected for the position of Engineer in Chief and Under Secretary for Public Works combined, this position would have been offered to me; Also that the conditions under which I will hold the appointment now offered will be similar in all respects to those under which I at present serve*."

The notices of his appointment as marine engineer, and that of Blair as engineer-in-chief and under-secretary, appear together in the *Gazette*.³⁷ It seemed a logical solution to the dilemma of who should head an essentially technical department. But the arrangement was only short lived and some friction between the top officers of the Public Works Department was to continue until the 1920s. A good deal of ill feeling had been created because of O'Connor and Blair's relationship. Some members of the department apparently felt that Blair's early death was "hastened by the struggle to establish the position of Engineer-in-Chief as head of the Public Works Department against the claims of the Under-Secretary, C. Y. O'Connor".³⁸ His ambitions frustrated, O'Connor, after barely a year as marine engineer, left for Western Australia, where he did some outstanding work as engineer-in-chief.

By 1890 it was clear that the Public Works Department had survived the various administrative changes of the previous 15 years without any permanent damage—with the exception of the unresolved relationship of administrative to professional head. But it was not clear whether the department would survive the adverse economic conditions that had dominated the period.

Between 1870 and 1876 New Zealand emerged from serious economic depression to enjoy a period of moderate prosperity based, according to economist Simkin, on a rise in export receipts and loan expenditures, "but owing most to an enormous expansion of credit".³⁹ It was at best an unstable prosperity

*O'Connor also reminded the Minister that "in an interview which I had the honour of having with you . . . a few days back, you were good enough to say, that you thought that in view of all the circumstances it would be only reasonable that I should get the offer of those positions [i.e., engineer-in-chief and under-secretary]." (N.A. M 1890/2189). As it happened O'Connor had already arranged to leave the country before they became vacant.

and there were signs as early as the middle of 1874, when bank advances and loan expenditures began to fall off, that it would not last. From 1876 on, the economic situation worsened, though this was disguised partly by a policy of renewed Government borrowing on a large scale. In the late seventies and early eighties the position fluctuated but: "None of the banks report anything but severe depression in New Zealand between 1883 and 1888, . . ." ⁴⁰

As the depression became apparent the position of the Public Works Department became increasingly insecure. There were several reasons for this. The proclaimed potential of Vogel's public works proposals had fostered utopian-type aspirations. When these were not fulfilled Vogel's scheme and everything associated with it came under the most critical scrutiny. As the chief executor of that policy the Public Works Department was particularly vulnerable. Initially people preferred to believe the policy was mismanaged, rather than question its validity.

So even when the economic signs pointed to the need for caution and restraint they were seldom observed*. The Grey Ministry sought to hide the signs by a borrowing policy more extravagant than Vogel's. The Railway Construction Bill of 1878 allowed for additional borrowing of up to £8 million. ⁴¹ In 1884 when the country was even more economically depressed Vogel tried to repeat the same trick, though this time he was unsuccessful. Well into the eighties the myth of overseas borrowing and extensive public works as a panacea for all ills was firmly believed by many New Zealanders. Rather than reject the policy the public looked for other scapegoats.

The Civil Service has always been a traditional target for retrenchment in times of economic adversity. A Royal Commission was appointed in 1880 "for the purpose of inquiring into the constitution and organisation of the Civil Service of New Zealand, and to consider by what means the cost of such Service may be reduced without impairing or lessening the efficiency thereof, . . ." ⁴² In summarising its own aims the commission, however, prejudged the issue:

"That one great object of our appointment was to collect evidence and obtain information useful to the Government and to the Legislature during the present session, and that would enable us to make some recommendations for immediate reduction in the cost of a service which is consuming so large a portion of the revenue of the colony at a time of great trial and depression, . . ." ⁴³

It assumed that the Civil Service was overstaffed, overpaid, and inefficient†, and it proceeded from this basis. At the time the two most visible departments were Railways and Public Works. Their operations affected the lives of most colonists in a very obvious and tangible way. Their presence was supposed to confer great good, their absence to contribute to failure. Both were singled out by the commission for special attention. Somehow it was felt that within

*In 1880 it was still believed by many that the railways alone could solve the country's problems: the 1880 Public Works report was ever optimistic: "We need not despair . . . of ultimately attaining a good result. We have covered the country with these stimulating and civilising agencies [railways]: in their neighbourhood settlement will extend, population and industries will increase . . ." (*AJHR*, 1880, Vol. I, E. 1, p. vii.)

†The commission's findings were not universally accepted. Vogel, for example, stated a few years later that "the pay of the Civil servants in this colony is less than in other colonies, whilst the officers are certainly on the average not inferior in capacity and capability. . . ." (*AJHR*, 1885, Vol. I, B. 1, p. xiii.)

these two departments lay the cause of the bad times. Condemnation of the administration of the Public Works Department was sweeping:

"We have long believed New Zealand to be fortunate in having in its service engineers devoted to their profession, and ranking high in professional ability; but, unfortunately, there is no necessary connection between these qualities and that controlling and organizing power required in the head of such a large and expensive staff . . . We have been able to find very little to commend in the results of its management, and have come to a very painful conviction that New Zealand has not received good value for the large sums that have been expended."⁴⁴

The chief complaint concerned the number of qualified engineers employed:

"Fifty-seven engineers at high salaries, and often with expensive offices, form a staff out of all proportion to the work to be done; and it is evident that these engineers, if fully employed at all, must be engaged on work not requiring a professional head."⁴⁵

The commission implied that the lack of skilled personnel, such a hindrance in the mid seventies, had ceased to be a problem by the end of the decade and instead there was an embarrassing number of qualified men available. Apparently engineers were found acting as accountants, as inspectors, and as clerks of works. It is not clear from its report whether this was caused by a lack of clerical assistance and the engineers were carrying out such duties in addition to their technical work, or whether engineers had replaced other workers in these jobs. It is hard to believe that New Zealand was such an attractive place in the 1870s that skilled technicians flooded the labour market. But it is likely that the Public Works Department was geared to an expansive policy of the Vogel or Macandrew type, rather than one of retrenchment as pursued by H. Atkinson, Finance Minister in the Hall Ministry, 1879-81.

The commission did, however, make a far more serious charge than that of overstaffing. This related to the professional standards of the department:

". . . the palpable engineering mistakes that are made, the evident inattention to common well-known requirements, and the want of adaptation of stereotyped plans to varying circumstances, have given us a strong impression that this costly staff is made to effect very little profitable result. Too often we have noticed in the engineers employed, a feeling of indifference as to the result of their work, and almost a sullen obedience to orders believed by them to be absurd."⁴⁶

One need not accept wholeheartedly the findings of the commission to allow that the professional attitude to their work of some engineers employed by the department was not as good as it should have been.

The reasons for this are to be found mainly outside the department itself. The history of public works from 1870 to 1890 (and indeed well into the twentieth century) is in many ways the history of public, private, and political pressure for private, political, and parochial ends. In the seventies public works in an area assured prosperity through employment opportunities, rising land values, and increased settlement. Public pressure for works, particularly railway lines, was widespread. It was manifest in several ways. In the late seventies Parliament was flooded with petitions praying for works in specified districts. In 1879 alone there were 70 such requests.⁴⁷ Usually the claims were straightforward—for a railway or a road through the named district. But occasionally they impugned the integrity and ability of Public Works Department staff. A typical example was the petition of William Elias and other settlers North of Auckland:

“The petitioners pray for the appointment of an impartial engineer to examine the proposed deviation of the Great North Road, . . .”⁴⁸

In this instance the Petitions Committee recommended that the Government comply with the prayer of the petitioners before proceeding further with the road. Such favourable recommendations were more frequently based on a desire to curry favour with the electors than any genuine evidence of inadequate technical assessment. But each such decision undermined the position of the engineers and made them aware that political rather than technical considerations might be paramount. This could only result in a growing cynicism and consequent disregard of high professional standards. Sometimes an engineer was called on to resurvey a line or route several times merely to satisfy one or other pressure group. John Blackett, when questioned by the Railways Commission about taking the Carlyle (now Patea) branch railway down the left bank against local opposition, was clearly exasperated:

“Whatever the community may say does not affect the engineering question. This is the third or fourth time I have had to go into this matter with different sets of people, and I feel rather strongly about it. It is an engineering question which no townspeople can settle.”⁴⁹

In another instance, Karl Weber sent a report to John Carruthers and explained that he had been under considerable pressure to alter his findings. He said he had brought down upon himself “the ire of some old friends” but he intended to stand by his original decision. “I cannot act otherwise,” he wrote, “as what I have observed with my own senses, I cannot be talked out, even at the risk of displeasing my best friends”.*

The question of the expense and the delay caused by unnecessary surveys was negligible compared to the number of uneconomic railway lines which were actually constructed as a result of public and political pressure. The engineer-in-chief or his deputy were bound to report on the economic and technical feasibility of any line under consideration. But their opinions were

*He was reporting on the route to Napier and investigating a suggested course via the Meeanee Bridge to Pakowai. Because of pressures on him, Weber had felt obliged to send his survey to Carruthers as a private communication, and not in his official capacity. (N.A. W1/1 1872/817.)

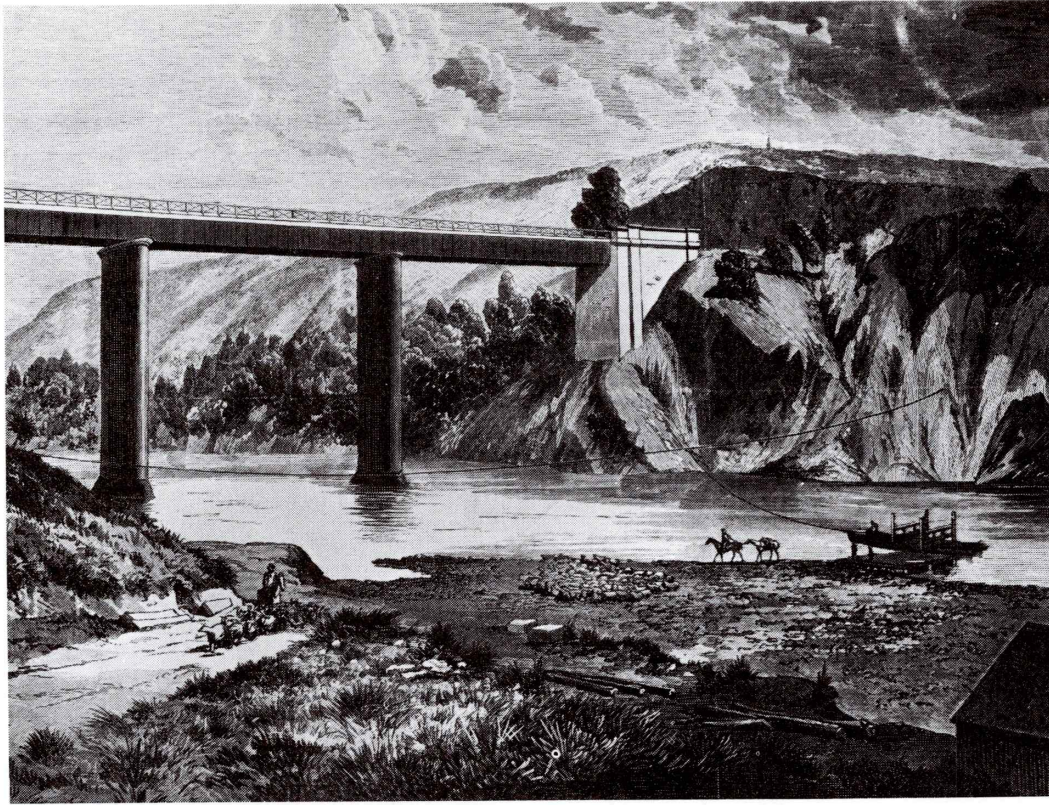
sometimes disregarded. The Otago Central and the Midland line were classic examples. Three unfavourable reports were compiled by department staff on the latter line.⁵⁰ But it went ahead because of the private interests of some politicians including Vogel and Stout.⁵¹ Historian K. Sinclair has pointed out that by “twentieth century standards there were quite unacceptably close links between business and politics”.⁵² These links should not be judged by twentieth century standards. The politicians of the 1870s and 1880s were predominantly laissez faire liberals who believed “that to seek private advantage was to serve social well-being”.⁵³ W. H. Oliver in *The Story of New Zealand* acknowledges that “Vogel used the state to facilitate the quest for personal riches” but adds that according to his political philosophy, “to make money was a social virtue”.⁵⁴

Of course politicians pressured for railway lines not only for private ends but also for political ones—and parochial interests served usually meant political ends gained. The Minister of Public Works James Macandrew, was described as “the very impersonation of local selfishness”.⁵⁵ In the 1878 public works proposals his province, Otago, was allocated eight branch lines, including 160 miles of the Otago Central railway.⁵⁶ This despite the unfavourable report on the latter line*.

In any democratic system it is difficult to draw a line between the parochial desires of the electors and the overriding national interest. Presumably the interplay of political and technical considerations between politician and civil servant helps to determine the line, and ultimately the civil servant must concede to the elected representative. There is no evidence that the Public Works Department’s recommendations ever departed from sound engineering principles in order to suit known views of the Government. But by the late 1870s the intrusion of political factors in the decision-making process was such that senior engineering staff were forced to give support to proposals they could not wholeheartedly endorse. Appearing before the Railways Commission in 1880,⁵⁷ the North Island Engineer-in-Charge John Blackett was forced to defend the construction of stations at Grahams-town and at Shortland within a mile of each other in spite of the fact that he had originally recommended a single site central to both townships. Furthermore he was required to begin reclamation for the two sites before work had begun on the railway up the Thames Valley. When questioned about this he told the Commission that he “acted in obedience to orders”⁵⁸ from his Minister, as indeed he was bound to do.

The atmosphere of political auctioneering surrounding public works undoubtedly communicated itself to Public Works Department staff though no evidence exists of outright corruption. Like their political masters some individual staff members probably sought to benefit themselves occasionally. In 1877 it was felt necessary to warn all officers about supplying quantities

*To accusations of provincialism Macandrew once replied: “Personally I have been very much criticised as being influenced by narrow-minded views. My political horizon has been said to be bounded on the north, south, east, and west by Otago. I am inclined to think that it is otherwise. I do not think there is any public man in New Zealand whose idiosyncracies are more cosmopolitan than my own.” (*NZPD*, Vol. 30, 24 October 1878, p. 1089.)



This bridge spanning the lower end of the Waimakariri Gorge was completed by the Public Works Department. The sketch was made in 1878 while the ferry was still in use. *Illustrated N.Z. Herald* by courtesy General Assembly Library.

to contractors: a circular from the engineer-in-chief stated that any "information out of the strict course of official duty", supplied, "directly or indirectly, by any officer, without the express direction or permission of a responsible Minister", would "meet with most serious displeasure".⁵⁹ It seemed to have the desired effect because there is no record of a subsequent infringement.

Although the Public Works Department was not responsible for the political log-rolling of the politicians, confidence in the department was undermined by the failure of public works built for political instead of economic or technical reasons*. This combined with the need to economise as the depression deepened in the eighties, facilitated the retrenchment of staff and the curtailment of the department's activities.

From 1877 there were periodic warnings that public works must decrease or cease altogether. In the Financial Statement of 1877, Vogel spoke of a

*It is interesting to note that there was wide recognition of the fact that many public works were undertaken for the wrong reasons. Politicians denounced each other—a member once said of Vogel "he introduced a system of putting railways where there was no traffic to go, and where there were very few passengers to travel, and where there was no country to be improved by the railways". (*NZPD* Vol. XXIX, 2 October, 1878, p. 490.)

And to some extent this was true of all who governed between 1870 and 1890. Though of Atkinson perhaps less than the others. But as the Financial Statement of 1877 pointed out, the politicians reflected the colony's attitudes: "... the House and the country have become accustomed to the belief that the desire of the people of a district to have a railway or other important work constructed, afforded sufficient reason for demanding that such work should be immediately undertaken". (*AJHR*, 1877, Vol. I, B. 2, p. 17.)

pledge to the House to reduce public works expenditure.⁶⁰ Three years later it was more serious*:

“We have no alternative, therefore, but to confine our operations to the extension of some of the incomplete lines to such nearest points as will bring them into use, and, as far as possible, make the expenditure already incurred to some extent reproductive.”⁶¹

In 1881 and 1882 staff reductions were supposed to be made. But when Minister Edward Richardson investigated the situation in 1884 he discovered that “the bulk of the officers who at that time disappeared from the list of the permanent staff were placed on temporary charge, and provided for out of the votes for construction works”.⁶² One section of the department that suffered from the first recession was the architects’ office†. When colonial architect William Clayton died in 1877 no one was appointed to replace him. This left Pierre Burrows‡ to carry on with the help of only one assistant and a cadet. As he pointed out in his report for 1878, he was forced to do as much work and assume as much responsibility as his predecessor for less money and lower status.⁶³ The Architectural Branch of the Public Works Department was certainly not overstaffed. The Minister, however, failed to heed Burrows’ plea to appoint another colonial architect and he continued to do the work without the title until his services were dispensed with in the economy drive of 1884.

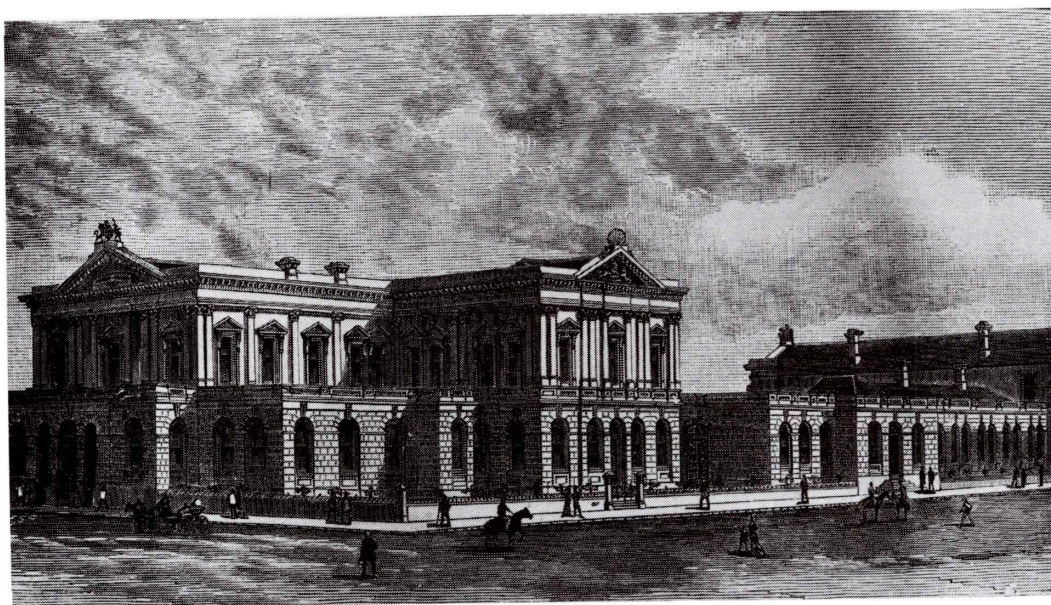
*The situation was so bad that the Annual Report of the Minister of Public Works attempted to encourage private individuals to carry out some public works themselves. It recounted the achievement of the self-reliant and public spirited Mr Firth of Matamata who removed snags from the river Thames at his own cost. It went on “In these days, when colonists are too much in the habit of looking to the Government for almost everything, it is refreshing to see a public work so useful to the community begun, carried on, and finished by a private person, without even an application having been made to the Government for aid from the funds of the colony”. (*AJHR*, 1880, Vol. I, E. 1, p. iv.)

†Salary cuts were made throughout the department. The Staff Register shows that most officers suffered a 10 percent cut between August 1880 and March 1881.

‡For brief biography see p. 283.



Pierre Finch Martineau Burrows (1842–1920), in charge of Architects Branch 1877 to 1884. *Ministry of Works*.



Designed by Architect P. F. M. Burrows the Supreme Court Buildings in Wellington were completed in 1881. *Illustrated N.Z. Herald* by courtesy General Assembly Library.

The first threat for the whole department came with Atkinson's Financial Statement of 1887. Its object was to bring the principal public works "to what may be called a state of interim completion—where we may pause without serious loss".⁶⁴ His report a year later was even more ominous. It included the bland statement that "our intention is, before the end of the year, to abolish the Public Works Department".⁶⁵ He proposed that the construction of railways, which would be on a very limited scale, would be undertaken by the Railways Department. All road work was to be handed over to the Survey Department which already carried out a portion of it and the care of public buildings was to be transferred to the Defence Department. Atkinson apparently felt that getting rid of the Public Works Department would exorcise some of the problems created by the extensive borrowing and subsequent drop in New Zealand's creditworthiness. It would, he said, "be strong and satisfactory evidence to the people of the colony and the outside world that we are really bringing our large borrowing policy to an end when the department which has been, if I may say so, its organ and symbol, finally disappears".⁶⁶ The Public Works Statement of the same year noted that public works were becoming of little importance in the affairs of the colony and commented "this is as it should be". The Minister assured the House that during the recess steps would be taken "towards the early abolition of the Public Works Department".⁶⁷

In 1889 the department was still in existence though shorn of most of its activities. One problem preventing its demise was the question of what to do with the staff. At least John Blackett had been catered for. In September 1888 he was offered the appointment of consulting engineer in London* which he accepted. Arrangements were made for his departure the following year. In March 1889 he formally resigned from the post of engineer-in-chief. And no one was appointed to replace him. At the end of its second decade the Public Works Department had apparently no future.

The years from 1877 to 1889 had not been happy ones for the department, but it could nevertheless look back on some creditable achievements. The most important work initiated in the period was the North Island Main Trunk Railway to link Auckland and Wellington†. This connection had not been omitted from Vogel's early visions and in 1874 John Carruthers explored the route from Ngaruawahia via the valley of the Waikato to Taupo, along the eastern side of the lake and the general route of the Desert Road to the Whangaehu and Turakina valleys. As well as discussing this route and possible variations, his report also reveals how little reliable information about the hinterland was available at that time.⁶⁸

The position had probably changed very little when in 1882 the Department was asked to undertake surveys to determine the best route for a railway to join the terminus at Te Awamutu with the lines in the southern part of the North Island. Carruthers had indicated three broad alternatives; the shortest route through the middle of the island, a connection to Taranaki, or one to Hawke's Bay.

It was a tremendous undertaking, both for the Department and for the individual surveyors. Between the terminals lay over 200 miles‡ of country, sparsely settled or lacking European inhabitants, practically roadless and with little more than native tracks. More than half the area was covered in dense primeval forest. Added to these physical difficulties was the fact that European settlement had not then penetrated to the interior of the North Island and the Maoris there were reluctant to see a railway open up their lands to the pakeha. As already mentioned in Chapter 2 the entire question of Maori affairs was difficult and complex. Although officially the wars had ended some 15 years earlier the Maoris were by no means subdued and much of the interior was still frontier country. Any European who ventured into their territory was likely to face hostility, particularly one who presented such an obvious threat as a surveyor.

In February 1883 C. W. Hursthouse received instructions to proceed with an exploratory survey southwards from Te Awamutu towards New Plymouth. After being turned back by the Maoris near Otorohanga, he and his assistant set out again with Wetere te Ringaringa as guide. At Te Uira, not far from Te Kuiti, "Te Mahuki, a native of doubtful reputation, and some 30 others,

*He received a letter saying that supervision of materials purchased in England was desperately needed and "this being so, and the intention of the Government at the same time being to bring the construction of public works in the colony to a close in a very short time, it is considered that your long and valuable services to the colony entitle you to the first offer of this English appointment, which has apparently greater prospects of permanence than the office which you at present hold. . . ." (*AJHR*, 1889, Vol. II, D. 7, p. 1.)

†This account of the surveys was written by J. H. Christie, a retired engineer at one time actively engaged on surveys for railways and roads.

‡For a man on foot, or even on horseback, to cover this distance would take over a week.



An early police station, originally one room.

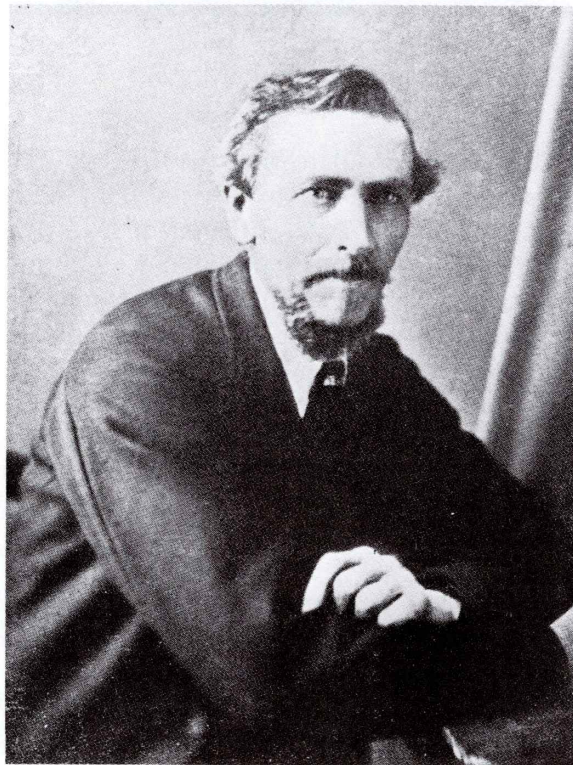
who were waiting on the side of the track, called out to the travellers to stop and go back. This invitation was declined by Wetere, upon which Mahuki called upon his followers to arrest the two white men. A scuffle ensued, during which the surveyors were pulled off their horses amidst great clamour and excitement. They were then taken a short distance and told by Mahuki to return. Wetere te Ringaringa replied that they would not do so. Thereupon the Europeans' coats and haversacks with their contents were taken from them, and, at Mahuki's command the prisoners were taken to Te Kumi, about a mile distant, where they were placed in a cooking-house, their hands tied behind their backs, and their ankles secured by chains."⁶⁹ They "were then left for forty-one hours, during which time they were kept without food."⁷⁰ Hursthouse was a fluent Maori scholar, the walls of their prison were thin, and he listened to a discussion on how they were to be killed.⁷¹ Wetere, seeing that further resistance was useless, left for Alexandra (Pirinoa), the nearest telegraph station, and managed to get a message through to the Native Minister, then in Auckland, who took immediate action for the release of the prisoners.⁶⁹ In mid-April Hursthouse and Newsham resumed their exploration, travelling along the usual native track to where it reached the Mokau

River, then down that river in canoes to the coast and overland to New Plymouth.⁷⁰ Later R. W. Holmes and Morgan Carkeek investigated an inland route from Stratford to Hangatiki.⁷²

The eastern route from Hastings to Te Awamutu via the Repia and Waikato valleys was explored and reported on by G. P. Williams.⁷³

Equally as dangerous and certainly the most frustrating experience was that of John Rochfort, who was in charge of explorations and investigations for the central route. Between Marton and Te Awamutu these extended over 220 miles, but Maori opposition led to extra travelling covering nearly 900 miles.*

He commenced work at Marton on 26 June 1883 and encountered almost incessant rain for a fortnight. The first natives met at Turangarere offered only feeble opposition but real trouble was met at Kerioi, where six armed men opposed him, saying if he went on he would be shot. Finding that Major Kemp (a Maori chief)⁷⁴ had some authority over these people he travelled to Upokongaro via Hale's track, encountering snow on the way. He saw Kemp and obtained letters to the local chiefs, and was able to continue to Ohakune.



*His own report on the difficulties encountered is reprinted in full as Appendix XIII and makes fascinating reading. What follows is merely an outline of his story.

John Rochfort (1832-94), engineer who carried out extensive railway location surveys. *Turnbull Library.*

From there he proceeded by native track to Ruakaka.* Unfortunately the man Major Kemp was to send had not arrived, and the inhabitants received the letters he carried with suspicion. They marched him back to Papatupu and after a korero lasting several days seven chiefs were appointed to paddle Rochfort's party to Wanganui. From there Rochfort proceeded to Wellington to seek the advice of the Native Minister. After returning he went on to a large meeting at Ranana and on 27 September left there accompanied by six canoes of Maoris. Further opposition was encountered when they arrived back at Papatupu, and again at Te Papa, where some 25 armed Maoris fired over their heads twice. After several days endeavouring to come to terms they were forced back "at the muzzle of the gun" and Rochfort returned to Wanganui for the third time. From there he contacted the Native Minister and asked for a few troopers. The Minister thought it unwise for him to force his way. On returning to Ranana Rochfort learned that the obstructionists had dispersed and he was able to complete his work to Waimarino. He then had to travel to see the chiefs at Rotoaira, Tokaanu, and Waihi to gain their influence with the Taumarunui Maoris. About this time two men arrived from Tuhua with news that two powerful *aukatis* were waiting to stop Rochfort. He had difficulty in persuading the two men a chief had promised would accompany him to do so; in fact on nearing Taumarunui they refused to go any further, and returned.

At Taumarunui Rochfort was received sullenly, without a word of welcome. After several days permission to go further was still refused and he had to return to Tokaanu and go round the west side of Lake Taupo to Kihikihi, some 150 miles. There he saw Rewi and Wahanui, and after waiting a week the Native Minister arrived, a meeting was held and matters satisfactorily settled, enabling him to complete his exploration. Rewi's parting words to him were: "Tell Mr. Bryce to hasten on the railway: I am an old man now, and I should like to ride in the railway before I die."⁷⁵

Rochfort's report on the exploratory survey was dated 5 February 1884.⁷⁶ His supplementary report with plans based on the work of his four survey parties and covering over 223 miles of traverse and levelling was submitted on 11 September 1884.⁷⁷

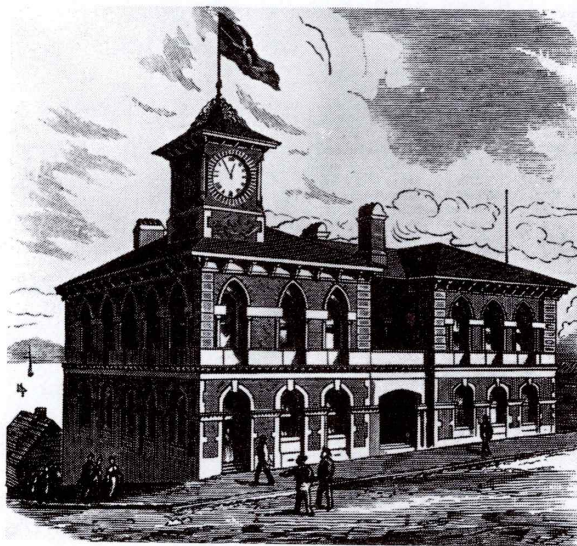
Rochfort's great hurdle was lack of communications. One could ask why he did not write away for what he needed. In actual fact he lacked the means. A map published in 1883⁷⁸ shows the nearest post and telegraph offices as at Te Awamutu, Taupo, Wanganui, and Marton. Postal facilities only were still distant at Mokau, Erewhon, Mangawhero, and KIWITEA. Telephone? Wellington's local exchange had opened with 31 subscribers only 4 months earlier.⁷⁹

A parliamentary select committee of South Island members (to ensure their impartiality and disinterestedness) chose the central route for the North

*Papatupu, Ruakaka, and Te Papa were all on the south side of the Manganioteao, respectively about two, eight and nine miles upstream from its confluence with the Wanganui River.



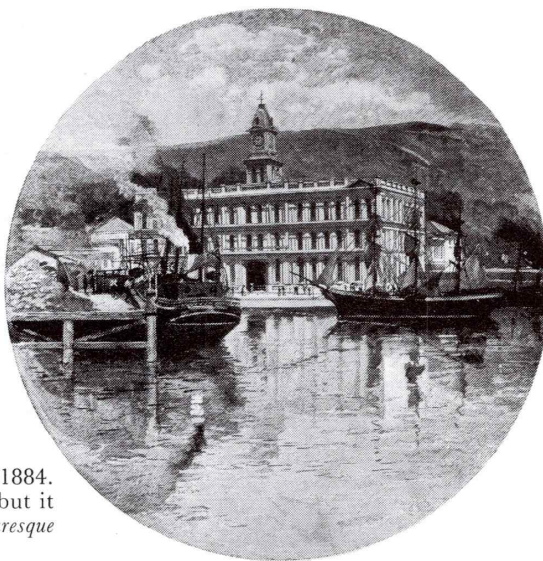
Government Printing Office, Wellington. Completed in 1888. Site now occupied by Rutherford House. *Turnbull Library.*



Designed by the Colonial Architect, W. H. Clayton, and opened in 1877, the Government Buildings at Lyttelton housed many departments of State. *Illustrated N.Z. Herald by courtesy General Assembly Library.*



Lambton Quay, Wellington. The building on left was completed in 1881 as a police court. It is still in use serving as offices for the Justice Department. *Burton Bros. Collection, Turnbull Library.*



Wellington Post Office, first occupied in 1884. It replaced an earlier one built in 1865, but it was itself burned down in 1887. *From Picturesque Atlas of Australasia 1886, Vol. III, p. 607.*

Island Main Trunk line.⁸⁰ By the middle of 1889, 34½ miles of railway line had been constructed at the northern and 18¾ miles at the southern end. Except for some surveys, access roads, and a tunnel, all work on the line then ceased.*

Several major roadworks were also completed during the period—these included the roads from Auckland to the far north, Blenheim to Nelson, and Nelson to the West Coast. Much of the work was of high quality. An overseer employed by the department was staying at Atiamuri at the time of the Tarawera eruption. His report to the engineer-in-chief revealed his surprise that so many of the road bridges in the vicinity had withstood damage. He described the eruption and the accompanying earth tremors:

“... as they [the shocks] increased in number so they increased in violence and dueration at intervils varying from five to fifteen minuts untill the out burst took place which was as near as I can say about 2 oclock the uplifting of the earth and the Crashing that was going on was most terrible I made sure all the Bridges was gone rent to peices but as soon as day light set in I went to look at the Bridge close by and to my great suprise found it standing I throughly inspected it and found it all right also the rest of the Bridges and culverts on my line”.⁸¹

*From 1886, when the first express ran right through from Wellington to New Plymouth, until the main trunk was completed, the quickest route from Wellington to Auckland was by train to New Plymouth and then by steamer to Onehunga. Under normal conditions the trip took 24 to 30 hours, 12 hours on the train and at least 12 on the steamer, but the latter time was often extended considerably because of the difficulty of working the Onehunga Bar and the roughness of the trip along the coast. (Tourist Dept. Itinerary of Travel, 1902 and later years.)

RIGHT TOP: Early bridle tracks often were later widened to form roads. Apparently that is happening in this picture. *McAllister Collection. Turnbull Library.*

RIGHT BOTTOM: Preparing to build a "china-man" or bin to guide the spoil into the earth wagons. Hammer and drill with explosives, pick, shovel, and crowbar were the main tools in use. *Ministry of Works.*

BELOW: Hazards of earlier years. The deep ruts have caused the collapse of this buggy.



In the first 20 years the Public Works Department had played a major role in the construction of a unified transport and communications system*, which in turn did much to make of New Zealand an effective economic unity. Although not always solely responsible for the activities, it had been involved in road and railway construction, immigration, purchase of Maori lands, water race development, schools, public buildings, and lighthouses. In cases where responsibility for expenditure devolved on a Minister other than Public Works, the department acted in a supervisory capacity—as agent for the relevant department.

Several new activities had been added to the Public Works Department's functions between 1876 and 1889. In 1885 there occurred an incident known as the "Russian War Scare". The colony was in an uproar over the wholly imaginary possibility of war with Russia†. Existing defence measures were viewed as totally inadequate to cope with a possible Russian invasion and the Public Works Department became involved for the first, but not the last time, in defence construction. For 2 years defence works were designed by military personnel but surveys and construction were carried out by the department. Then in 1887, the panic over, they reverted entirely to the Defence Department.⁸²

Relief of the unemployed was the most significant new activity of the department. Until the mid seventies labour had been a scarce and expensive commodity in New Zealand. By 1878 the unemployed were so numerous in some areas that public works were especially instituted in particular localities to absorb them. In these circumstances the men were employed at piece-work rates which barely enabled them to earn a subsistence wage. The report on public works in the Middle Island for 1880 calculated that 9d. an hour was the maximum a man could earn, and that the terms were being altered so a married man would only earn 28s., and a single man 21s. a week. The latter received rations worth 1/3 per day.⁸³ By 1887 provision for relief of the unemployed was a normal part of the Public Works Department's budget. In the financial year 1886–87 expenditure on relief had amounted to £16,629 and provision was made in the estimates for £30,000 for relief for the succeeding 4 years.⁸⁴

Although the 1880s was generally a period of deep depression and widespread unemployment, the years 1882–83 saw a temporary shortage of labour.⁸⁵ Wages for unskilled labourers briefly rose to 8s. a day‡. And the department had considerable difficulty recruiting labour in this period. But it was a very temporary situation and by 1887 wages were back to 6s. 6d. or 7s.⁸⁶ There were ambiguous feelings about the use of the department for unemployment relief. In 1887 the Minister of Public Works "regretted" the necessity, because most of the projects which were used for unemployment relief were unproductive. He considered that "no relief

*Of course the system was by no means complete and at one stage a member suggested that carrier pigeons should be used "as a means of extending the advantages of the telegraph. Dovecotes should be erected at, say, eight of the principal telegraph stations in each island, where the birds could be bred, and could then be used as the means of communication with every house in the country the owner of which chose to take advantage of them. He would not enter into details, but he might say the system could be started for an expense of not more than £2,000". (*NZPD*, Vol. 30, 29 October, 1878, p. 1215.)

†The Public Works statement of 1885 reported: "At the end of March last it was considered advisable, owing to the threatened outbreak of war with Russia, to place the chief ports of the colony in a state of defence as far as the means at the disposal of the colony admitted, and to commence the construction of the necessary works for the reception of the guns. These works were proceeded with vigorously, and in about 3 months the whole of the guns available in the colony were mounted, and the necessary magazines, stores, barracks, and enclosing parapets are now in a fair state of completion." (*AJHR*, 1885, Vol. II, D. 1, p. 20.)

‡During this period prison labour was used on some buildings, particularly prisons. Reporting on the Wellington and Auckland prisons, architect Burrows

Continued on p. 60.

continued from p. 59.

noted that "prisoners cannot be expected to take the same interest in work that free men do; therefore the building operations do not and will not progress so rapidly . . ." (*AJHR*, 1883, Vol. II, D. 1, p. 45.)

works that can possibly be avoided should be undertaken, as we believe that it is detrimental to the interests of the men themselves to keep them employed on purely relief work, which, after all, is merely another name for charitable aid".⁸⁷ However, the relief agency role remained with the Public Works Department for the next 40 years and there was no basic change of policy until after 1935.

In the 20 years to 1890, the department had experienced 11 Ministers, some of whom governed for only a few days, others of whom reappeared in various ministries.⁸⁸ Only E. Richardson had any technical knowledge—he was a qualified engineer—but his terms of office are not distinguishable from those of the other Ministers.

Ministries could rise and fall without any major changes in public works administration. New Zealand was governed by cliques with similar socio-economic backgrounds and political philosophies. The only significant differences that affected the Public Works Department were the centralist or provincialist tendencies of the ministries (though the difference was merely one of emphasis) and the disagreement over whether to pursue a policy of economic caution or extensive overseas borrowing. The department had been created at a time of stagnation to help rejuvenate the economy; its abolition was proposed during a period of economic recession to help balance the budget. Had it ceased to exist in 1889 it would already have played a major role in shaping New Zealand's physical development.

REFERENCES CHAPTER 3

- ¹ *AJHR*, 1877, Vol. I, E. 1, p. 6.
- ² The summary of the reports of these bodies given by Heron on pages 115 and 116 of his thesis is somewhat astray.
- ³ *AJHR*, 1877, E. 2, p. 14.
- ⁴ *Ibid.*, 1875, E. 3, p. 58.
- ⁵ *Ibid.*, 1877, I. 5, p. 1.
- ⁶ *New Zealand Gazette (NZG)*, 1878, pp. 304 and 533.
- ⁷ *AJHR*, 1877, I. 5, p. 71, questions 1790–1792.
- ⁸ N.A. W2, 78/5037.
- ⁹ *Ibid.*, W4, Circular No. 7–77.
- ¹⁰ *Ibid.*, North Island Circular No. 2–79.
- ¹¹ *Ibid.*, enclosure with 2–79.
- ¹² *AJHR*, 1880, Vol. II, H. 2, p. 8.
- ¹³ *Ibid.*, p. 4.
- ¹⁴ *Ibid.*, p. 9.
- ¹⁵ *Ibid.*, 1878, Vol. I, E. 1, p. iii.
- ¹⁶ *Ibid.*, p. xiii.
- ¹⁷ *Ibid.*, p. iii.
- ¹⁸ *Ibid.*, 1878, Vol. I, E. 1, p. iii.
- ¹⁹ N.A. W2, 78/1445, 1 April.
- ²⁰ *Ibid.*, 78/1515, 12 April.
- ²¹ *Ibid.*, 78/2000, 16 May.

- 22 *NZPD*, Vol. XXXI, 17 July, 1879, p. 46.
- 23 *Ibid.*
- 24 N.A. W2, 83/1209, 14 March.
- 25 *Ibid.*, 83/1890, 3 May.
- 26 *Ibid.*, 83/1067, 8 February.
- 27 *Ibid.*, 81/4356, 6 October.
- 28 *Ibid.*, 83/198, 9 January.
- 29 *Ibid.*, 83/4889, 19 November and *N.Z. Gazette*, 1883, p. 1664
- 30 *Ibid.*, 84/6310A, 1 December.
- 31 *Ibid.*, 85/883, 5 February.
- 32 *Ibid.*, 85/5451, 12 October, and 85/5733, 20 October.
- 33 *Ibid.*, 84/1109, 8 March.
- 34 *Ibid.*, 84/3959, 8 August, 84/4182, 9 August, and *N.Z. Gazette*, 1884, p. 1255.
- 35 *Ibid.*, 89/1044, 15 May.
- 36 *Ibid.*, 90/572A, 10 May, and 573A 12 May.
- 37 *Ibid.*, 90/582, and *N.Z. Gazette*, 1890, p. 565.
- 38 Furkert, p. 118.
- 39 Simkin, p. 163.
- 40 *Ibid.*, p. 165.
- 41 *NZPD*, Vol. XXX, 25 October, 1878, p. 1104.
- 42 *AJHR*, 1880, Vol. II, H. 2, p. 3.
- 43 *Ibid.*
- 44 *Ibid.*, p. 8.
- 45 *Ibid.*
- 46 *Ibid.*, p. 9.
- 47 *Ibid.*, 1879, Session I, Vol. II, I. 3, and Session II, Vol. I, I. 1.
- 48 *Ibid.*, 1879, Session I, Vol. II, I. 3, No. 9.
- 49 *Ibid.*, 1880, Vol. I, E. 3, p. 211.
- 50 Rosanowski, G. J., "The West Coast Railways and New Zealand Politics, 1878-1888." *New Zealand Journal of History*, Vol. 4, No. 1, p. 34.
- 51 *Ibid.*, p. 35 et al.
- 52 Sinclair, K., *A History of New Zealand*, London, rev. ed., 1969, p. 163.
- 53 Oliver, W. H., *The Story of New Zealand*, London, 1960, p. 118.
- 54 *Ibid.*
- 55 *Colonist*, 23 October, 1877, quoted in Rosanowski.
- 56 Rosanowski, p. 37.
- 57 *AJHR*, 1880, Vol. I, E. 3, p. 211, question 3985 et seq.
- 58 *Ibid.*, question 3995.
- 59 N.A. W4, Circular 23/77, 16 August, 1877
- 60 *AJHR*, 1877, Vol. I, B. 2, p. 2.
- 61 *Ibid.*, 1880, Vol. I, E. 1, p. viii.
- 62 *Ibid.*, 1884, Vol. I, Session II, D. 1, p. 1.
- 63 *Ibid.*, 1878, Vol. I, E. 1, p. 78.
- 64 *Ibid.*, 1887, Session II, Vol. I, B. 1, p. xvi.
- 65 *Ibid.*, 1888, Vol. I, B. 6, p. vii.
- 66 *Ibid.*
- 67 *Ibid.*, Vol. II, D. 1, pp. 1 and 12.
- 68 *AJHR*, 1874, E. 3, pp. 5 and 38.
- 69 *Progress*, Vol. I, pp. 348, 349, 1906, "North Island Main Trunk Line; A National Undertaking".
- 70 *AJHR*, 1883, D. 1, p. 38.
- 71 Furkert, p. 194.
- 72 *AJHR*, 1884, Session I, D. 5, p. 10 and (with maps) Session II, I. 6, p. 98.
- 73 *Ibid.*, pp. 6 and 95.
- 74 See *An Encyclopaedia of New Zealand*, Wellington, Government Printer, 1966, Vol. 2, p. 218.
- 75 *AJHR*, 1884, Session I, D. 5, p. 5.
- 76 *Ibid.*, p. 1 and (with maps) Session II, I. 6, p. 87.
- 77 *Ibid.*, p. 91.
- 78 *Ibid.*, 1883, F. 1, facing p. 24.
- 79 *Ibid.*, p. x.
- 80 *Ibid.*, 1884, Session II, I. 6, p. v.

- ⁸¹ N.A. W1/1, 1886/2870.
⁸² *AJHR*, 1887, Session I, Vol. II, D. 1, appendix J, p. 44.
⁸³ *Ibid.*, 1880, Vol. I, E. 1, appendix E, p. 60.
⁸⁴ *Ibid.*, 1887, Session II, Vol. I, D. 1, p. 11.
⁸⁵ *Ibid.*, 1883, Vol. II, D. 1, appendix J, p. 58.
⁸⁶ *Ibid.*, 1887, Session I, Vol. II, D. 1, p. 39.
⁸⁷ *Ibid.*, Session II, Vol. I, D. 1, p. 11.
⁸⁸ See appendix VIII.

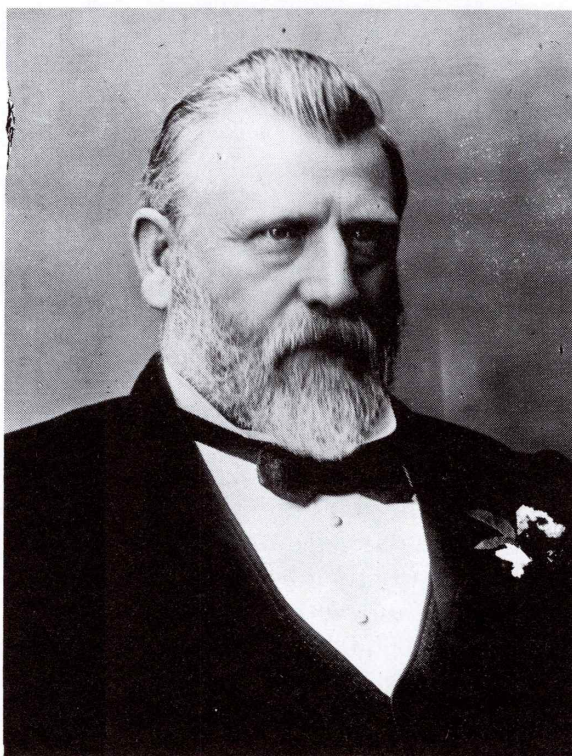
CHAPTER 4 / *A Going Concern*

“Mr Fergus said the honourable gentleman was aware that the Government did propose—and when the time came would carry into effect—the abolition of the Public Works Department. . . . [But it] was certain that the Public Works Department—by whatever name it might be called—must remain to some extent.”

(*NZPD*, Vol. 69, 4 September 1890, p. 543.)

In spite of the plans of 1888 to abolish the Public Works Department it was still operating in 1890. In the House of Representatives the Minister, Thomas Fergus, was forced to justify why he had not carried out his predecessor's promises. Fergus's immediate reply was to reassure members that the Government had been taking steps towards abolition and was “still taking steps in this direction”.¹ The main obstacle was £1,000,000 of unexpended loan money that had been raised specifically for public works. The Public Works Department was granted a reprieve in order to supervise this expenditure. Fergus hastened to reassure critics that once the money had been spent “it would be quite possible to wipe out the department”.² As evidence of his good faith he noted that when his Government had taken office there were 155 officers on the Public Works Department staff and that in 1890 there were only 57. However Fergus's figures did not convince all his parliamentary colleagues that it was policy to eliminate the department. Some doubted that it was valid to talk about staff reduction when there was evidence to suggest that allegedly dismissed officers had simply been given transfers to other civil positions.³ Certainly Fergus's choice of words—“it would be quite possible”—was something less than a positive assurance that the department would disappear. Eventually, when further pressed to define Government policy, he denied that total abolition had ever been contemplated. He interpreted his predecessor's statements as meaning no more than drastic staff reduction.⁴

A study of the staff records shows that drastic reduction of Public Works Department staff began in June 1887, a few months before the Atkinson Ministry took office.⁵ Between June and the end of September the services of 27 officers were terminated. Fergus's claims for his own ministry are substantially correct although he excludes so-called temporary officers from consideration. Nor did dismissals end with the defeat of the Atkinson government. On 24 January 1891 the Ballance ministry took office, with Richard



Richard John Seddon (1845–1906), Minister of Public Works, 1891 to 1896. *Turnbull Library.*

*It is perhaps a little surprising to note that during this period there were 16 appointments. But a closer analysis of the appointments shows that they were usually on a short term basis for supervision of a particular project.

†In April 1888 the Government had taken control of the West Coast coal harbours and the Public Works Department had become responsible for work done at Greymouth and Westport. At Greymouth the work consisted mainly of two breakwaters carried out about 1,700 ft into the sea. The general plan for Westport was similar to Greymouth's but on a larger scale. (*NZPD* Vol. 68, 25 July 1890, p. 169.)

When the Liberals came to power they planned to return these harbours to the control of a locally-elected board. (*AJHR* Session II 1891, Vol. II, D-1 p. 15.)

John Seddon as Minister of Public Works. By the beginning of July a further 19 officials had left the department. As for the charge that most were simply gone to other departments, Fergus noted 33 transfers but argued that they were not necessarily doing the work of the Public Works Department. He asked what was wrong with filling vacancies in the Civil Service with "suitable and worthy officers in the Public Works Department, instead of sending them adrift".⁶ In fact between June 1887 and June 1891 36 officers were transferred mainly to the Survey or Building Departments.* Although the Public Works Department was not dead by 1890 its activities were severely curtailed.

Arrangements had been made for the transfer of roading, railway construction, and supervision of public buildings (as well as some minor responsibilities) to other departments. Theoretically this left the Public Works Department with only harbour works,[†] but the transfer of railway construction was never, in fact, effected. Fergus refused to comply with the Railways Act of 1887 that authorised the change on the grounds that the commissioners could not handle extra work at that time.⁷ It is probable that the Minister accepted the concept of a permanent Public Works Department and realised that it was essential to New Zealand's development. On the

other hand he was not prepared to discredit members of his own government who had strongly advocated its discontinuation. Even in 1890 the Public Works Department was capable of arousing very heated reactions. In a speech remarkable for its emotive excesses and singular lack of logic, W. C. Buchanan, member for Wairarapa, claimed that "while he had the greatest respect for the officers of the Public Works Department, still he thought that they were utterly unfit to conduct the roading of Crown lands, and that that work could be carried on at much less cost by the local bodies, or by the Lands Department".⁸ Actually it was the Survey Department that had responsibility for roading of Crown lands* and much of the work was executed by the Public Works Department acting for it. What is more, a number of Survey Department officers had served previously with the Public Works Department. The department, however, survived rational and irrational criticism. Fergus's reprieve, at the crucial moment, enabled it to hang on until the end of 1890 when the election of the Liberals to power confirmed, once and for all (although this was not obvious at the beginning of their term) that its existence would be guaranteed.

The new Minister was Richard Seddon. He was to become one of New Zealand's most dynamic premiers. His role as Public Works Minister is less well known. He was the most flamboyant Minister the Department had ever experienced. Of later Ministers only Bob Semple would match his extrovert personality. And only Semple, and possibly J. G. Coates, effected changes in the Public Works Department which surpassed Seddon's in significance. He transformed the department from a planning and advisory body to the country's largest construction agency. However it was only during his successor's (William Hall-Jones) term of office that tangible results of this new role became evident. It was Seddon who introduced the practice of the Minister visiting construction projects around the country. He took a personal interest in every job and he used his visits to great political advantage. It was on these trips that he was able to make himself known to a wider public than that of his electorate on the West Coast. Historian W. Oliver attributes some of his success to his gargantuan appetite, which he says "in keeping with his immense physique, became a political asset; wherever he went he feasted and caroused with the local Liberals, promised them nothing (being shrewdly aware that their good fare was a bait to catch a road or a bridge), but won his way into their hearts with his unforced good fellowship".⁹ Not all his contemporaries were impressed with the way he ran his department. He was condemned for the amount of travelling he did:

"The honourable gentleman, the Minister for Public Works, as I have said, is of a restless disposition. He must be rushing over the country in special trains and in special coaches, and must be working with his active mind upon every detail of the public works. Let me say this: that after

*The Crown Land Department was not amalgamated with the Survey Department until 1891, when it became Lands and Survey.

long experience my own belief is that Ministers cannot govern properly unless they have men to do that sort of work for them. The real essence of government is that Ministers should have men whom they can trust, and whom they can send to other parts of the colony to do the work that ought to be done, without doing what is practically professional or Under-Secretaries' work themselves. There is no worse thing, to my mind, than an expert Minister."¹⁰

This statement is interesting not just for its criticism of Seddon, but for the question it raises of the relationship of a non-specialist Minister to his technical department. In a more lighthearted vein a former Minister of Public Works, E. Mitchelson, decried Seddon's presentation of his annual statements:

"We are told in the first paragraph of the Statement that the Public Works Statement of to-day, as compared with former Statements, has lost its attractiveness; and in order to make the Statement more attractive the Premier, with that desire for economy he has so often exhibited this session, and during his term of office, has had the Statement most elaborately and expensively bound; and, as I understand this is the last Public Works Statement he is going to deliver in this House, in order to perpetuate the name of Richard John Seddon he has engraved it upon the front of the cover in letters of gold."¹¹

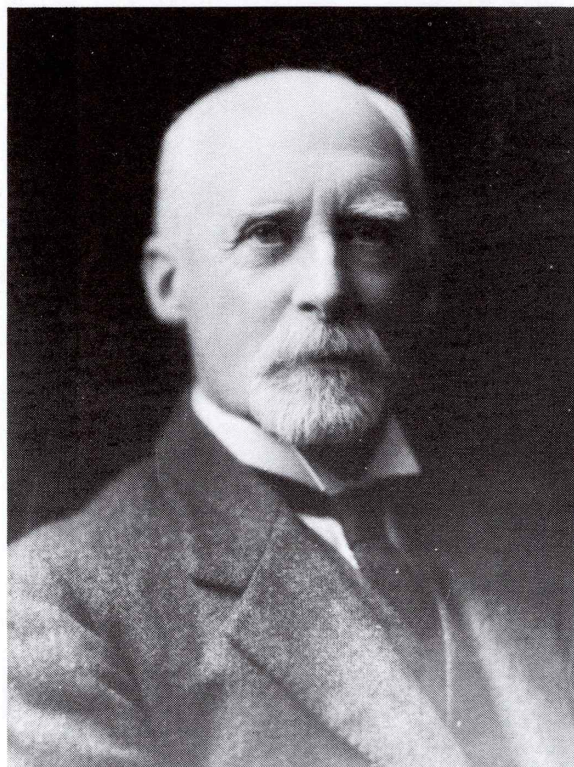
Initially Seddon set about cutting down the size of the department. He claimed that it was "considerably overmanned in view of the reduced amount of work which it is now called upon to perform".¹² But his intentions were limited to reducing and reorganising the department's personnel. Prospects of abolition, already receding in 1890, had vanished by 1891. Having first reduced staff numbers drastically, Seddon then tried to ensure maximum efficiency by clearly defining and then dividing administrative and professional duties. When he became Minister of Public Works, William Blair held the positions of engineer-in-chief and under-secretary. But he died on 4 May 1891 and Seddon took the opportunity to separate the two offices. He supported his action with the argument that "the colony cannot afford to pay professional officers to perform work of a clerical nature",¹³ and accordingly appointed William Hales engineer-in-chief and Blow under-secretary. Blair had been ill for some months before his death and during that time Hales was brought down from Auckland, where he was district engineer, to hold the combined posts in a temporary capacity. Five weeks after Blair's death he became simply acting engineer-in-chief and Blow became acting under-secretary. Hales was almost 61 and apparently quite content to be engineer-in-chief without aspiring to be head of department. On the other hand Blow, assistant under-secretary before his promotion, was relatively young and ambitious. Their permanent appointment to these



Horatio John Hooper Blow (1855–1933),
Under-Secretary Public Works 1891 to
1916. *Ministry of Works*.

positions did not, however, pass without comment. There were some politicians who apparently thought that with Blair's removal from the scene C. Y. O'Connor should have been called back to take his place. Rolleston agreed that it was "a sad spectacle to me in the past to see engineers wading through huge parcels of vouchers, doing work which should be done by those whose services are less valuable".¹⁴ He reminded Seddon that O'Connor was a man "whose knowledge of the country and whose professional ability were of the highest service in rearranging that department and reducing it to order", and he warned that "the lack of a permanent head of the department, who is capable of guiding him in all matters connected with the practical administration of the department, will be seriously felt by him".* Despite Rolleston's forebodings the department settled back to the dual system with few difficulties. This was due in large measure to the personalities of the senior officers. It is evident from departmental records and circulars that Hales was quite happy to work through Blow on non-technical matters and that Blow in fact assumed several functions which had previously been undertaken by the engineer-in-chief. Hales did not retire until 1906 at the age of 76—as the staff record notes "on a/c of old age".¹⁵ He was

*It seems clear that O'Connor had been a political protege of Rolleston's for in the same speech he said he took "a great deal of interest" in retaining O'Connor as head of the department; that "the loss of Mr O'Connor from the position of Under-Secretary was . . . one which ought to have been averted, even at considerable cost to the colony", and concluded "it was an evil day . . . when Mr O'Connor was allowed to leave. We had for years and years been educating him and giving him an experience in every part of the colony, and in one day we parted with that which it had taken years to acquire." (*NZPD* Vol. 74, 11 September 1891, pp. 560–561.)

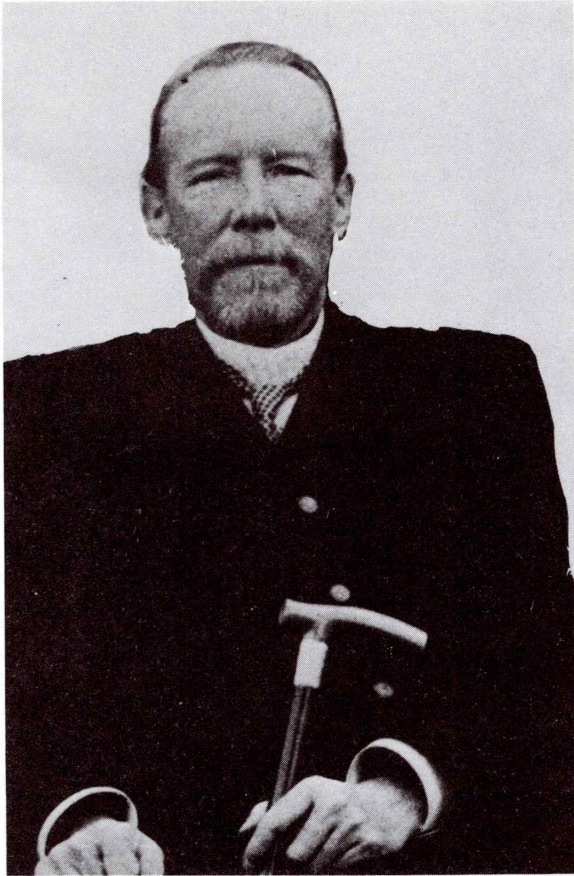


Robert West Holmes (1856–1936), Engineer-in-Chief 1907 to 1920, also Under-Secretary for a period in 1920. *Ministry of Works*.

followed in quick succession by Peter Hay and Robert Holmes neither of whom showed any desire to unseat Blow. When he retired in 1916 his deputy William Short* succeeded him. Like Blow, Short was an administrator of considerable talent and reputation, and equally ambitious. His seniority in the public service made it unlikely that he would be passed over when the position of under-secretary became vacant. But it was during his term that the problem again became an issue. F. W. Furkert was probably responsible for this. He was Holmes' obvious successor as engineer-in-chief and he was not only an able engineer but also a strong personality who liked to be in command. In 1909 it had been stipulated that all public servants must retire at 65 years of age.¹⁶ When Short retired in May 1920, only 2 months remained before Holmes' own retirement and, doubtless at Furkert's prompting, the under-secretaryship went to him—and then to Furkert. Since 1920 the head of the department has always been a professional engineer, though given the current diversification of the department's activities there is no reason why this should continue to be so.

The period from 1890 to 1920 was one of steady development for the Public Works Department. It began with Seddon dismissing staff, but

*For brief biography see p. 284.



William Stonham Short (1852–1927), Under-Secretary Public Works 1916 to 1920. *Ministry of Works.*

before the century had ended his successor, William Hall-Jones, was urging increased numbers. In order to make the request acceptable to his cabinet colleagues he pointed to the “large amount of work performed by the Public Works Department on behalf of other departments of the public service.”¹⁷ But this was only one reason. More important was the fact that in the mid-nineties the economic situation improved and overseas borrowing, on a moderate scale, again became possible. This in turn led to renewed pressure for public works throughout New Zealand. As the economy revived first Seddon, and then Hall-Jones, began to reverse the fragmentation of public works administration which had begun in 1888. In 1895 Seddon proposed “in the interest of a more perfect system of public-works administration”¹⁸ the amalgamation of several departments then controlling public works. He suggested that the Public Works Department should have charge “of the construction and maintenance of roads, public buildings, lighthouses,

*The difficulties enumerated by Hales and Blow were:

- (1) Extensive new legislation would be needed, as the powers to acquire land and build railways were vested in the Public Works Department.
- (2) Public Works officers had certain rights as civil servants; since January 1889 Railways officers had been on a different basis.
- (3) The Public Works engineers functioned as an integrated unit; the transfer of an appreciable number to the Railways Department would cause considerable disorganisation.
- (4) No economy would result, as the small number of engineers in the Railways Department were already fully occupied.
- (5) The Railways Department engineers had no experience with the co-operative contract system.
- (6) The combined system has not worked well in Western Australia.
- (7) Uniformity of practice could be as readily obtained by full co-operation between the two departments.

They submitted that the proposed transfer should be deferred for further study. (N.A. W1/327, 19/510.)

†Actually it was quite clear from Hall-Jones' statement that he considered things should remain as they were. (*AJHR*, 1896, Vol. II, D. I, p. vi.)



Sir William Hall-Jones (1851–1936), Minister of Public Works, 1896 to 1908. *Schmidt Collection. Turnbull Library.*

harbour works, and defence works".¹⁹ Railway construction was to be allocated to the Working Railways Department. According to Hall-Jones such reallocation of responsibilities was "not entirely free from difficulty"²⁰—few readily give up empires and Government Ministers and their departments are no exception. On 25 February 1896, a Cabinet direction ordered the Public Works Department to hand over railway construction to the Railways Department. The chief engineer of the Railways Department and the under-secretary and engineer-in-chief of the Public Works Department were to organise the change. After three meetings it was obvious they could not agree. The Public Works Department's men thought the difficulties too overwhelming to contemplate change,* the Railways chief engineer just as emphatically disagreed. His main concern was that knowledge gained through operating experience be applied to the design of new works. After considering the reports of his officers, Hall-Jones announced he could reach no final decision but that steps would be taken to secure close co-operation between the technical sections of the two departments.† Railway construction was never removed from the Public Works Department, and eventually responsibility for roading was transferred back to it.

However the most significant innovation of the whole period was the introduction of the co-operative contract system. Until 1890 the department had let contracts for all construction work, but there were innumerable problems associated with this practice. Basically these stemmed from the shortage of skilled contractors in New Zealand to undertake the extensive works initiated during the Vogel era. Right from the start the public works programme was plagued by uncompleted contracts—the failure rate was alarming but not surprising given the Government's invariable acceptance of the lowest tender regardless of experience, ability, or capital; and given the number of totally unqualified people eager to leap on to the public works bandwagon in the hope of being around when the money was dished out. The spectacle of everyone from the local publican down tendering for a public works contract was reminiscent of the earlier rush to the gold fields—success and failure rates were also comparable. Something of the frustrations and difficulties of Public Works staff in their efforts to supervise such contractors is revealed in the following report from C. Y. O'Connor on the efficient construction of the Nelson Creek water race:

“The headworks are now completed, and the thoroughly trustworthy and workmanlike manner in which they have been carried out reflects great credit on the contractor, Mr. Price, who was some time since an Inspector in the Government service, and the very satisfactory manner in which he has completed this contract, the workmanlike and systematic way in which he went about it from the first, and the reasonable cost at which it has been carried out, without trouble, litigation, or arbitration, all go to show how advantageous it is to get well-trained experts as contractors in the case of any works of magnitude, rather than the in-experts who so frequently tender lowest and get the contracts, and then end by doing everything in a slow, bad, and slovenly manner, and becoming bankrupt themselves into the bargain. It is certainly a fact that the cases in which trouble has arisen in this district with contractors who were tradesmen, and understood their work, have been very few, if any at all; while the troubles and arbitrations in the cases of contracts made with storekeepers, publicans, and such like, have been numerous, and the work done by them seldom as satisfactory in the end as if it had been done by an expert.”²¹

Various attempts were made to remedy the problem, mainly by holding the sureties to their bonds and strictly enforcing the penalties for overtime.²² But this was treating the symptoms and not the causes. The whole system of private contracting fell into such disrepute that Public Works Department Under-Secretary Blow could savagely attack it with official blessing in the 1894 *New Zealand Yearbook*. He condemned it for enabling “a class of middlemen, in the shape of contractors”, to make “large profits out of their undertakings” by ill treating their workmen and by subcontracting work.²³

He argued that the contracting system allowed an anomalous situation to develop where the principal contractor made a large profit, his subcontractor was ruined, the workmen left unpaid and the local business people who supplied stores and materials were unable to recoup the money owing them. The cavalier attitude of many contractors to their employees had by 1890 resulted in the department having to supervise not only the standard of workmanship but also the working conditions of the contractors' employees. It was the responsibility of the local Public Works Department engineer to ensure for example that wages were paid regularly and that certain safety precautions were observed. Not infrequently the department was forced to step in, take over and complete jobs abandoned by the contractors. So in many ways the introduction of the co-operative contract system seemed simply to remove an already redundant intermediary—the contractor.

However the failure of private contracting was not the only reason for the new system. By 1890 New Zealand had experienced a decade of continuous depression and before that 15 years with intermittent slumps. Whereas previous governments had represented only the landed minority the Liberals were swept to power by the landless, the working man, the unemployed, and the small shopkeeper. Their policies reflected this support. They were practical men and the reforms they introduced were based largely on their own experience rather than idealistic political theory. Nothing illustrates this better than the introduction of the co-operative contract system.²⁴ Early in the 1890s, contracts had been let, in the normal way, for parts of the Ngakawau-Mokihinui Coal Railway. But some of the contractors did not even make a start and men who had hoped for employment on the line were left stranded. Unemployment in the district reached critical levels, so Seddon suggested that the men divide themselves into groups of about 50. Each party selected trustees who were responsible for arranging for the work directly from the Government—and wages were divided equally among the whole group. Payment was based on the engineer's estimate of the value of a particular job—and it was supposed to allow "a first-class workman to earn an average wage per day of eight hours slightly in excess of what a contractor would pay him for the same work".²⁵ The first experiment was a great success and Seddon quickly recognised the value of applying the scheme generally, though with some modifications. Smaller parties of 10 or 12 men were found to work better—the fewer men the easier it was to match temperament and ability. And trustees were replaced by headmen who received a small supplementary payment in recognition of their extra duties.

As far as the Government was concerned the new system had a number of advantages. It offered much greater control over the standard of work because departmental staff supervised the workmen directly instead of liaising through a third party. All materials were supplied from Government

stores which ensured uniformity of quality. It allowed maximum flexibility to expand or to restrict the work if physical or economic conditions changed because co-operative contracts covered relatively small sections of a project and there were no legal difficulties or added expenses involved in renegotiating the earning rates of the small parties. At the same time it provided the Government with a useful unemployment relief scheme—it was a simple task to draft extra men onto the most reproductive works, or to initiate small jobs in districts of high unemployment, without having to commit significant sums of money for the whole project as was necessary with private contracting. The Liberals' approach to unemployment relief was quite different from their predecessors. Earlier governments had been mean and grudging in their attitude to the unemployed. When they had been forced to provide relief work wage rates had always been minimal. As a result the unemployed were unhappy and their work suffered accordingly, which seemed to justify the belief that relief works offered a poor return to the country, therefore governments were persuaded that minimal amounts should be paid for such work—and so the vicious circle continued. Seddon decided that the unemployed should be given the opportunity to earn a decent wage on co-operative contract and he wrote in glowing terms of the results of this policy:

“Previously the Government were paying 4s. 6d. per day to the men, and the result was that the State received but a poor return for its pittance, as no interest of course was taken in the work. Now the men . . . are paid so much per chain for the work, and the total cost has not exceeded what it would have been had the work been done by contract, and the men employed are well satisfied. Men who had been working under the old system, and who the overseers had considered were not able to do a fair day's work, and who were consequently not worth even the 4s. 6d. per day which they were paid, have turned out excellent work, and are moreover anxious and eager to do the work. Instead of being disappointed and complaining as they were in the past, they have been made happy and contented, and have been able to put by a little money.”²⁶

But the use of co-operative contracts to relieve unemployment was to reveal some important weaknesses in the system.

As a final reason for its introduction, the Liberal Ministry was genuinely concerned for the position of the labouring classes and sincerely believed that co-operative contracts placed “the workman on a much higher plane, and enables him to comprehend more fully the dignity of labour”.²⁷ It is interesting to note that the modern sociological approach to worker participation in industry compares very closely with the workings of the co-operative contract system. An Australian social scientist, Dr F. Emery, recently described worker participation as the means by which “the worker makes the

decisions about those things that affect his day-to-day job".²⁸ He proposed semi-autonomous groups of workers who took full responsibility for a particular job, planned the methods of working, set their own pace and targets, determined who their working companions would be. He argued for the scheme in terms of efficiency and humanisation of work. Although the engineer retained greater power than Dr Emery envisaged for management in the 1970s, his proposals and theories of worker participation are not so very far removed from the practice of Seddon's co-operative contracts. Unfortunately later leadership in New Zealand lost sight of the humanitarian aims of the system.

At first only formation work on roads and railways was undertaken on co-operative contract, but the list was soon expanded to include small bridges and culverts, then the supply of sleepers, laying of permanent way, construction of timber bridges up to £2,000 in value, masonry abutments, stations, and other public buildings.²⁹ And so it continued to grow until the 1940s when mechanisation and the complexities of modern construction methods seemed to require a different approach.

When the system was first introduced it met with considerable opposition from the Liberals' political opponents. The previous Minister of Public Works summed up the main objections to the scheme in a heated denunciation of it:

"There was no man acquainted with the carrying-on of public works but who knew that the present system of co-operation—falsely so called—had resulted in the colony obtaining about half the amount of work that ought to have been obtained for the amount of money expended. . . . The co-operative system had been made the means of every political loafer bringing pressure to bear on the Government—that loafer being of the right colour—to obtain employment, to the detriment of those who did not believe in the Minister for Public Works or his policy."³⁰

He went on to single out workmen erecting a fence around Parliament Buildings as typical of the "political loafers" he was referring to. As a result of their indolence and incompetence he alleged that the cost of the fence had risen from £105 to £178.³¹ In fact the rise in cost was the result of a new estimate by a Public Works Department engineer after a basic error had been discovered in the original calculations. Engineer-in-Chief William Hales was quite prepared to endorse the system. In a letter quoted by Seddon in Parliament he wrote that "having personally inspected most of the railway-construction works now being carried out under the co-operative contract system, and made careful examination from time to time of the various schedules of quantities and prices of the works contracted for, as well as of the charges for plant, material, and incidental expenses of management, I find that very satisfactory results are in all cases being obtained from the introduction of this system of contracting for large railway works".³² He further sug-

gested that "as the prices fixed are estimated at ordinary fair contract rates, and the Engineers, Inspectors, and other officers ordinarily employed in the supervision of contract works, undertaking all the duties of the contractors and their staffs, the saving in management alone will be a considerable item in the cost of the works".³³

It is difficult to establish figures reliable enough to make a genuine comparison of costs between private and co-operative contract. A table published with the 1896 Public Works Statement claimed to show that the co-operative method was cheaper, as did figures published in 1903. The 1903 return stated that the mileage cost of all government railways opened for traffic up to 31 March 1891, was £6,808; while for those opened between 1 April 1891 and 31 March 1903, the cost was £6,762. An accompanying comment noted:

"While the cost of construction under the co-operative system is thus shown to be less than under contract, honourable members are aware that we are also now using heavier rails and more sleepers per mile; that our bridges are in most cases now built of steel instead of perishable timber, thus minimising the cost of future renewals; that the cost of all material and labour has increased; and that more extensive station accommodation . . . is now provided than during the period first mentioned."³⁴

However as mechanisation of construction work increased the co-operative system became correspondingly less efficient because it had as one of its aims the provision of maximum employment.* This meant that use of heavy equipment and machinery was limited in favour of the pick and shovel.

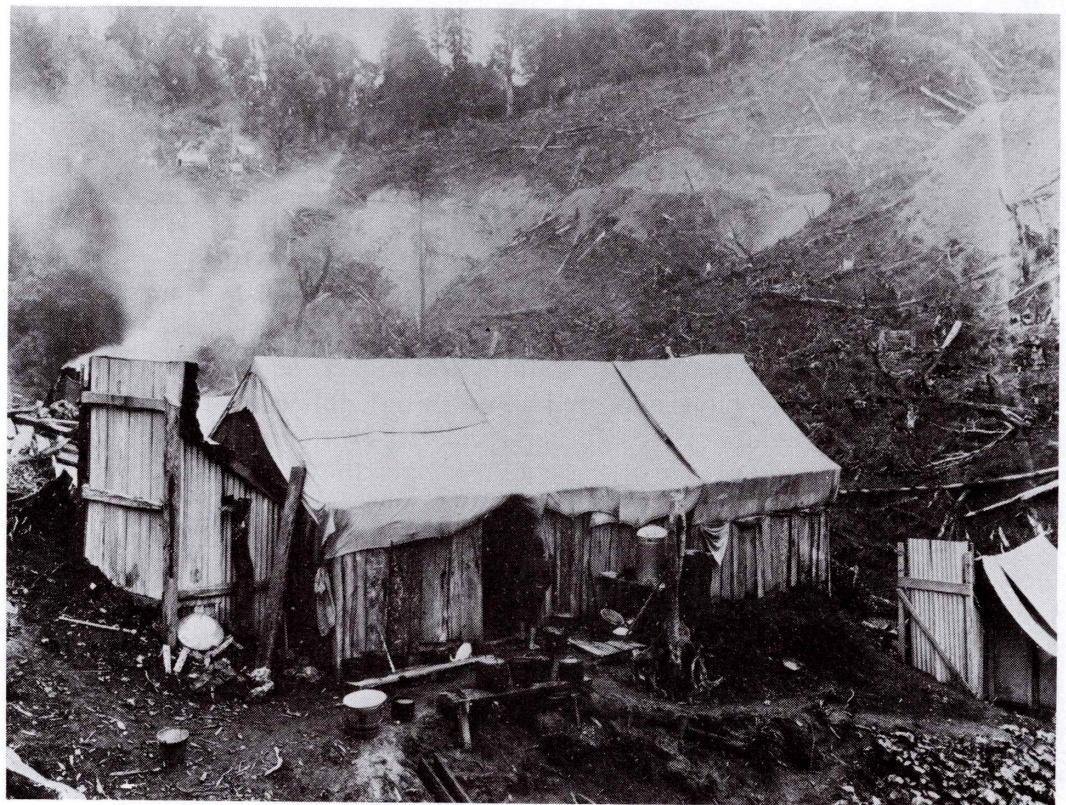
In the early 1890s the Public Works Department evolved from a planning and supervisory body into the foremost construction agency in New Zealand. Departmental engineers and other permanent staff adjusted to their new roles fairly easily. Increased responsibilities and duties were readily accepted. One could reasonably have expected some initial difficulty in the relationship between the co-operative workers and departmental officers. In fact when the extent of the power of the engineer over the workers is realised the lack of conflict is even more surprising. He was responsible for pricing the work and for assessing what would amount to a good day's labour from the men. He could fire at will, dismiss headmen elected by their parties, and supplement the number in a party at his own discretion. Co-operative workers had neither the independence of private contractors nor the security of employees of the Public Works Department. Though there were periods when they were regarded as departmental employees, particularly at the turn of the century; and they were covered by the Workers Compensation Act. Yet friction developed only after the turn of the century when the system had been operating for some considerable time. There were several reasons for this, but the most important point is that after 1900 the conditions for

*The original system of selection reveals the emphasis on relieving unemployment—the following rules were the basis of selection:

1. Applicants not previously employed on Government co-operative works have priority of claim over men who have recently been so employed.
2. Men resident in the neighbourhood of the works have priority over non-residents.
3. Married men have priority over single men.
4. In recording the applications of men who have previously been employed on Government co-operative works, the dates when they left such works are noted, and those longest off such works are considered first.
5. All applicants for work must have been at least 1 week out of employment before they can apply, and all men previously employed on Government co-operative works must have been at least 14 days off such works prior to re-registration as applicants for further work.

(NZOR 1894 p. 240.)

co-operative workers on Public Works Department jobs deteriorated not absolutely but relative to the position of the rest of the community. In 1891 the co-operative contract was a symbol of hope for the unemployed and the unskilled. But conditions in New Zealand changed and what was good enough for the 1890s was unacceptable in 1910. As long as either Seddon or Hall-Jones was in control the system was fair to the workman because they generated within the department and in the Government respect for the men on the job and an understanding of their problems. But New Zealand society seemed to become more conservative after 1900 and by 1910 there was little sympathy for the co-operative workers who complained about their obviously inadequate conditions. In 1891 co-operative workmen having to live away from home were issued with one tent free of charge. If their families lived on the job two were available. The standard size was 6 ft by 8 ft. Twenty years later there had been no improvement although the department's permanent employees were entitled to a special allowance if they were compelled to endure the hardships of tent life.³⁵ In 1898 a sketch of a single room hut



Typical of the construction camps in the Ohakune-Raurimu area about 1907 during the building of the North Island Main Trunk Railway. *Turnbull Library.*

had been circulated to all engineers with the suggestion that huts might be used instead of tents "when convenient and where the material required for same can be obtained at reasonable rates and easily got on to the ground".³⁶ Apparently few engineers felt the huts justifiable. With no facilities for communal dining rooms or any form of recreation workmen were expected, as one unhappy labourer wrote, "to live, eat, sleep, cook, and keep their food and all their belongings within the confines of a 6 × 8 scrim-like piece of calico!"³⁷ If any engineer tried to increase the comfort of his men he was soon reprimanded. A circular in 1908, for example, complained that an "unreasonable number of tents and flies have been issued free of cost to men employed on railway construction whose families reside on the works".³⁸ It reminded engineers that free issues to workmen were to be strictly limited to two tents and three flies. Conditions were at their worst on the Christchurch–West Coast (or Midland) railway and the North Auckland main trunk line. Both were isolated from population centres and the South Island one in particular was subject to atrocious weather conditions. The isolation meant that food and household supplies were expensive; the bad weather made life unbearable. Work was subject to frequent interruptions. As pay depended on the amount of work done earnings were often inadequate even for a bare subsistence. At the end of 1910 a good deal of publicity was given to conditions on co-operative works between Broken River and the Cass in the South Island. A union organiser, H. A. Campbell, reported that everywhere he went he found "a seething discontent" because of small wages and bad accommodation,³⁹ and he called for an inquiry into the system and its administration⁴⁰ which he claimed was being run "solely in the interests of the officials, and not in the interests of the men".⁴¹ A month later H. T. Armstrong of the West Coast Workers' Union declared that on a visit to Cass he had found conditions infinitely worse than Campbell's descriptions of them. Both men blamed the department's engineers for underpricing jobs and ignoring the men's complaints.

The department's response was to set up an inquiry under Assistant Under-Secretary Short, which he conducted in January 1911. His report revealed a breakdown in communication between workers and officials. He showed that to a great extent living conditions depended on the attitude of the engineer in control of the project and that it was up to the individual officer to ensure the men were comfortable. Immediately after the inquiry authority was given for the construction of 50 huts for single and 25 for married men working on the Midland line. Engineers throughout New Zealand were instructed to supply any single man who asked for it with an 8 ft by 10 ft tent to live in by himself.⁴² Although Short denied any evidence of underpricing for particular jobs, a ministerial directive subsequently raised the basic rates for works in the area.

As long as co-operative works continued to be regarded, at least in part, as unemployment relief there was unlikely to be substantial changes in living conditions or wages. An editorial in the *Christchurch Press* explains why:

"... it should be remembered that the Government co-operative works partake, in certain respects, of the nature of charitable aid. For instance, a private contractor would not engage many of the men employed on the Government works. . . . To some extent the Government co-operative works provide work for men who are unable to find work in the open labour market, and it may be assumed that one reason they cannot get work is that they are unable to give value for the ruling rates."⁴³

But the co-operative contract continued to exist not just to alleviate unemployment but also because it was the most efficient method of executing certain types of work. The inability to see the contradictions inherent in these conflicting aims undermined the advantages of the system. In its attitudes to co-operative contractors the department generally took its lead from the Government. Early in the new century governments became increasingly unsympathetic to workers' demands particularly after 1911 and so the relationship between Public Works Department officers and co-operative contractors continued to deteriorate. To the engineer the role of provider of relief work for the unemployed was most unwelcome. The engineer in charge of a construction job was looking for skilled navvies, not soft unskilled labour from the cities. Navvying is hard physical work and contrary to popular belief there is plenty of skill to be acquired. In the 1900s labourers and navvies were just beginning to form unions to protect their interests and improve their working conditions. D. B. Waterson in a thesis on "railways and politics" noted strong opposition from the Public Works Department to such moves. Referring to attempts of the Federation of Labour in 1913 to form unions among the isolated railway construction workers he comments on the "veiled hostility of the department in general, and of its engineers and overseers in particular".⁴⁴ Circumstances were to force a softening in this attitude, though in 1913 the change was many years away.

Although not extensively used, private contracting did continue to play a part in public construction in the years between 1891 and 1920. Initially it was intended that the role of the co-operative contract would be very limited. In 1892 the spokesman for the Government claimed that "contractors who were able to carry on their work honestly had nothing to fear from the present system of co-operative labour. The Public Works Department only trenched upon what was known as unskilled labour, and the system had nothing to do with buildings or bridges."⁴⁵ By 1895 the system had been extended to the erection of public buildings and by 1896 a departmental circular reminded all engineers that wherever practicable works were to be carried out on the co-operative principle and that no work was to be done by competitive

tender or day labour without special permission from Head Office.⁴⁶ That year the decision was taken to have the technically difficult Makohine Viaduct near Mangaweka constructed by a co-operative work force. Economic considerations dictated the change in policy between 1891 and 1896. Tenders for the Makohine Viaduct were several thousand pounds in excess of the engineer-in-chief's estimate.⁴⁷ So the co-operative system came to apply to skilled as well as unskilled workers. The viaduct was successfully completed in 1902 and the Public Works Department was justifiably proud of it. It did not follow from this however that even in similar circumstances the department was automatically awarded a job ahead of private contractors. In 1910 the engineer-in-chief made out a strong case for the construction of the Otoko Viaduct by the department. He pointed out that the Public Works Department could do the job for over £1590 cheaper than a private firm. To strengthen his case he supplied the Minister with some comparative figures:

"The steelwork of the Hapuawhenua Viaduct [erected by P.W.D.] was manufactured and erected complete for £22 5s. per ton and that of the Toanui Viaduct [also a P.W.D. job] for £23 15s., while at the same time the Government was paying £35 per ton to Messrs Anderson for the erection of Manganui-o-te-ao Bridges and £34 per ton for the erection of Makatote



The Makohine Viaduct on the North Island Main Trunk Railway, the first major structure designed, fabricated, and erected directly by the department. Length 765 ft, height 238 ft. Completed 1902. *N.Z. Railways Publicity.*

Viaduct; allowing £2 per ton for the extra cost of carting and £1 per ton for staging on Messrs Anderson's contract the Government saved at least £8 per ton by carrying out the erection of the two viaducts referred to by its own staff."⁴⁸

Minister McKenzie and Cabinet decided that it should be let for private contract and it was.⁴⁹ Private contracting was extensive enough to necessitate the establishment of a Tenders Board in 1909. The intention was to remove the awarding of contracts from political influence. Indeed the procedure then established for tendering remains almost unchanged today.⁵⁰

By 1920 however a majority of public works were being carried out directly under the auspices of the Public Works Department. In the 20 years from 1900 railway construction had continued to dominate public works. Lines were still built largely as the result of political influence and public pressure. Both the Liberal Party and the Reform Party used the promise of railways as election bait (examples are well documented in Waterson's thesis) and political success continued to depend on one's ability to attract public works to an electorate. W. F. Massey, Reform's leader until his death in 1925, used to tell a story about two competing candidates in a rural electorate. The sitting member announced that he had worn out the carpet on the stairs leading to the Minister for Public Works room, so keen had he been to secure grants for his constituency. His opponent scornfully replied that he would not only wear out the carpet but also sleep on the doormat.⁵¹ However the overtly political nature of much railway construction should not detract from the achievements of the Public Works Department during this period.

Work had resumed on the North Island main trunk not long after the Liberals won office in 1891. It proceeded at a leisurely pace and it was only after 1900 that any real effort was made to finish it. In 1900 the Minister reported that the line should be open within 4 years.⁵² It took twice that time and the first regular through expresses left Wellington and Auckland on 15 February 1909. The two real obstacles to its construction had been Maori opposition to land acquisition and fluctuating economic circumstances. All significant Maori resistance had been overcome by 1890 but the economy was not so easily controlled. In 1904 the Government reviewed its 1900 prediction and announced that 1908 would see completion of work on the line. Until 1905 it had been policy to work on each end of the line with the aim of eventually joining the two. In October 1905 however it was decided to open a central section with headquarters at Ohakune.⁵³* Materials for the job were taken from Wanganui to Pipiriki and then by horse and wagon to Ohakune. Winter weather and the state of the roads prevented a regular supply service being established. Poor weather hampered progress on the works even when supplies were available. But the Government, determined at all costs to get the line finished, apparently blamed the engineer

*The original strategy for building the line included independent access to Turangarere, Ohakune and Taumarunui, and during the eighties much work was done on these routes. (*AJHR*, D. 1s, 1885, pp. 4, 31; 1886, pp. 4, 29-31, Enclosure 4 in Appendix H; 1887, pp. 4, 33, 34; 1888, pp. 14, 33; 1889, p. 4.)

in charge of the section, J. J. Hay. In February 1907 Hay was transferred to Nelson and F. W. Furkert, at the time responsible for the Taihape end of the line, replaced him. Hay's staff felt that he had been unfairly treated* and were somewhat suspicious of their new superior.⁵⁴ However if there was any possibility that the line could be completed by 1908 Furkert was the man to do it. He was an able engineer, disconcertingly energetic and totally dedicated to his work. His high pressure methods are well illustrated in the following story from a then member of his staff about his first journey over the proposed route north of Ohakune:

"He had quite a party with him, including men to clear tracks, &c. and someone to carry Abney level and compass (God knows what they were for). Another assistant was always at hand carrying the plans showing the longitudinal section of the railway. Mr Furkert had evolved some approximate rule of thumb for taking out earthwork quantities per slide rule. Pauses were made at every cutting and filling as it was reached, when the 'plan carrier' had to unroll his plan for Mr Furkert's scrutiny. His slide rule was rapidly brought into operation and with much manipulation of its slide and its cursor (irrespective of quite a number of tired members of his staff who could well be classified with the last mentioned portion of the slide rule) he would announce, for instance '50,000 cubic yards, that should be finished in September.' Then a scramble for the next obstacle, when the same procedure would be followed by a similar announcement."⁵⁵

Furkert recognised straightaway the main source of Hay's problems—he ensured supply service by having a service railway run to Ohakune from the south, on a steeper grade than planned for the permanent line. This went for 3½ miles between Waiouru and Tangiwai. From there it more or less followed the permanent route to a temporary siding north of Ohakune. A service road was then constructed to Horopito. Even with these improvements the 1908 deadline seemed unrealistic.

Hall-Jones repeatedly visited the works and his visits emphasised the Government's determination to keep to its latest deadline. Opening day was tentatively scheduled for November 1908. On one of his visits to Ohakune, however, Hall-Jones mentioned to Furkert that he should like to take a parliamentary party from Wellington to Auckland to welcome the American fleet on 9 August. "I want you to scour the district," he told the engineer, "to procure coaches and horses or any alternative suitable conveyances to take the party from railhead to railhead and, of course, trains over the unopened lines as far as you can, so that the trip through can be made in 24 hours."⁵⁶ But horses were very scarce and singularly hard to come by. This was just the sort of challenge that appealed to Furkert. The dialogue that follows is Furkert's own recollection of what occurred:

"'How would it be if I took you all the way by train?' said Furkert.

*Although his staff thought otherwise and the necessary records are no longer available, Hay's shift could well have been a normal one—Furkert had virtually completed the section he was working on.

'You couldn't do that,' said [the Minister]* as quick as a flash.

'I'm not so sure,' said Furkert.

'I'd give you a thousand pounds if you carry it through!' said [Hall-Jones] in a state of excitement.

'You're a witness to that, it's a bet,' said Furkert, turning to Sir John Findlay, who was accompanying the P.W. Minister.

With no more ado, authority was given to strain every nerve to make the connection if humanly possible, . . ."⁵⁷

Every Saturday a telegram had to be dispatched to the Minister giving the position of the railhead. Innumerable short cuts were taken and new methods devised to get the two ends meeting. Four days before the special express was due the rails were joined and a Public Works Department train with standard carriages was run over the line to ensure that it was wide enough. Frequent stops were necessary to remove projecting boulders and assorted obstacles. Then with the official trip only 2 days away the last straw came when the construction staff were advised that the sleeping carriages were appreciably wider than the standard ones. A frame simulating the cross section of the larger vehicles was hurriedly built and attached to the end of a guard's van and the whole process of widening the passage was repeated. It was completed just in time for the fleet train to go through. Which it did, hauled by the Public Works Department works locomotives,[†] because those of the Railways Department could not negotiate the unfinished portions of the track. The parliamentary party arrived in Auckland in time to welcome the fleet but not early enough to see the evening performance of Mother Goose at which seats had been reserved for them.[‡] There is no record of whether the Minister paid out on the bet.

The Christchurch-West Coast line was the South Island equivalent of the North Island main trunk. In 1885 the Midland Railway Company, based in England, had contracted with the Government to construct 235 miles of railway from Springfield via Arthurs Pass to Stillwater and thence to Belgrove near Nelson at an estimated cost of £2,500,000 (\$5,000,000) within 10 years. Payment was to be largely by way of land grants. By March,

*Furkert mistakenly refers to Hall-Jones as Sir William. He was not knighted until 1910.

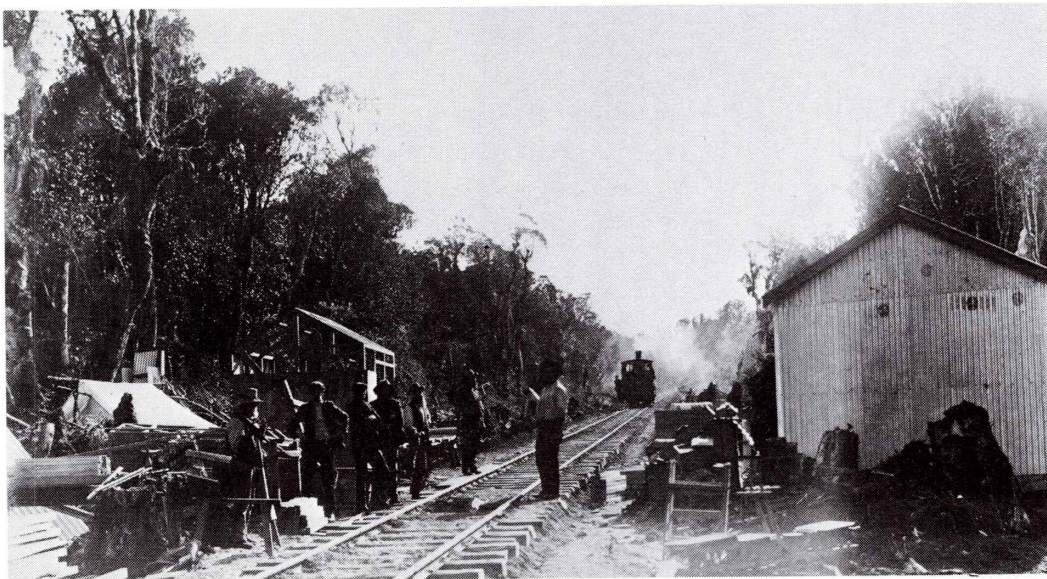
[†]At one stage it took five of them.

[‡]It is interesting to see a 1908 timetable for the trip from Wellington to Auckland before the regular express service was established:

Departs				Arrives			
Railways Dept. train	..	..	Wellington ..	7.50 a.m.	161m.	Taihape ..	5.10 p.m.
Overnight stay							
Railways Dept. train	..	..	Taihape ..	8.30 a.m.	6m.	Mataroa ..	8.55 a.m.
Public Works Dept. train	..	..	Mataroa ..	9.15 a.m.	36m.	Ohakune ..	11.55 a.m.
Coach	..	..	Ohakune ..	12.15 p.m.	18m.	Waimarino ..	4.00 p.m.
Lunch at Makatote							
Public Works Dept. train	..	..	Waimarino	4.00 p.m.	32m.	Taumarunui	6.20 p.m.
Overnight stay							
Railways Dept. train	..	..	Taumarunui	8.10 a.m.	175m.	Auckland ..	5.00 p.m.

(From Tourist Department "Itinerary of Travel" February, 1908.)

1894 the company had completed only 69 miles of railway on the easier portions of the route. With no prospect of better progress, in 1895 the Government terminated the contract and took possession of the works already completed. The company contested this action and an appeal to the Privy Council was finally decided in favour of the Government. These legal complications were insignificant when compared with the physical problems encountered. Not the least of these was the question of how to traverse the main divide. The company's plans, though somewhat nebulous, had allowed for an 8½ mile rack-rail system with gradients as steep as 1 in 15 going over Arthurs Pass without a tunnel.⁵⁸ Once it took control the Public Works Department set up a committee of its own engineers to study the problem. In August 1900, the committee recommended a line with grades limited to 1 in 37 and with a tunnel just over 6 miles long. An American engineer engaged to give an independent opinion substantially confirmed this, the line finally adopted having a tunnel 5¼ miles long on a grade of 1 in 33. In August 1907 a private firm contracted to do the tunnelling, but by 1912—the agreed completion date—barely half the job had been done. The firm asked to be relieved of its obligations and after a Parliamentary Select Committee had considered the matter, the Public Works Department took over. The Public Works Department already had a resident engineer on the job, as was customary with any large contract. Much of his time had been spent in smoothing relations between the company and its workmen. The company's contract



Pushing the railway through bush country in Taranaki, 1908. *McAllister Collection. Turnbull Library.*

with the Government had laid down minimum standards of living and working conditions. Its failure to comply with these caused innumerable disputes and stoppages that were a significant factor in the company's failure to complete the job. In an impassioned letter to the *Greymouth Evening Star* conditions in the tunnel were graphically described:

"It is time the Government made inquiries regarding the conditions generally at Otira with a view of forcing the contractors to carry out their agreement, for there is nothing surer than that this undertaking will be responsible for sending scores to an early grave if a better system of ventilation is not adopted. The drive is very wet and the men engaged there are wet through before half the shift is done. I notice also that most of those working in the tunnel are affected with bad hands. The least knock that causes the skin to be removed allows some mineral in the water to eat into the flesh causing large sores which very often compel the sufferer to lose work, and the huge sum of 10s. per shift is paid to men who have all these difficulties and dangers to face."*

*Semple also complained about the standard of the huts which he claimed did not meet Government requirements. (*Greymouth Evening Star*, 8 August, 1908.) A report from an agent of the Department of Labour in Greymouth substantially concurred with the points raised by Semple and supplied other examples of inadequate conditions. (N.A. W1, 1911/8601.)



LEFT: Where the rail now runs. Clearing the track through the primeval bush for the North Island Main Trunk Railway. A. W. Bathgate in *N.Z. Graphic* 9/6/1906.

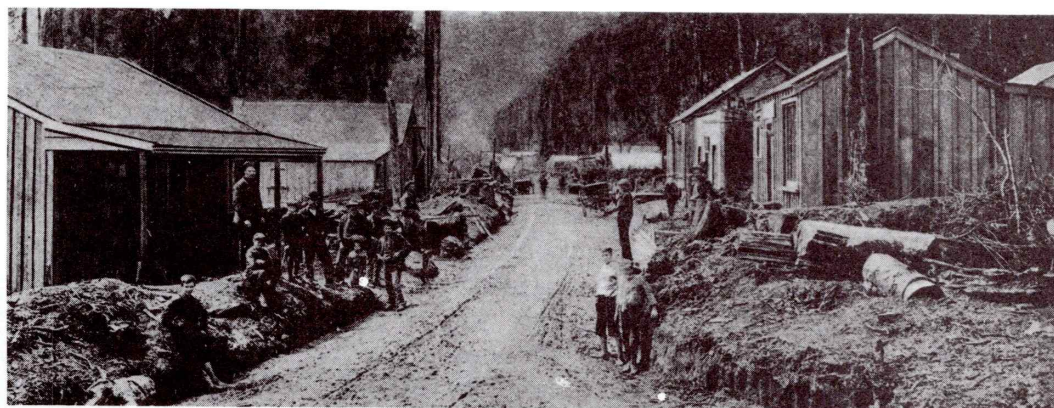
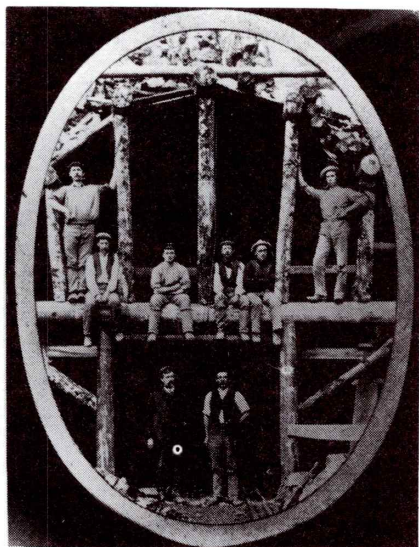
OPPOSITE PAGE:

LEFT TOP: A tunnel gang on the Midland line. This picture gives some idea of the heavy timbers required to support the ground. C. 1905. *Godber Collection. Turnbull Library.*

RIGHT TOP: The premier shows how it's done. The start of the Westport Inangahua railway, 1906. *Turnbull Library.*

BOTTOM: Raurimu in 1907. A construction headquarters for work on the North Island Main Trunk Railway. *N.Z. Railways Publicity.*

The writer was R. Semple who as Minister of Public Works in the late thirties did more than anyone else to improve working and living conditions for the department's employees. But in 1908 he had no effective power, though he did receive support from the Department of Labour which asked the Public Works Department to investigate his complaints. When the Public Works Department took over the tunnelling, it inherited the labour problems which were endemic until the job was finished. The tunnel, which was not finally opened until 1923, is nevertheless a credit to the department's engineering skills.* The work was wet and unpleasant all the way through.† But in spite of all the difficulties when the bottom headings met in July 1918 the discrepancy was only $1\frac{1}{8}$ in. in level and $\frac{3}{4}$ in. in alignment.



*Both the Government and the Public Works Department were pressured to get the tunnel finished before 1923. A concerted campaign in Christchurch in April 1919 resulted in telegrams being sent from such disparate groups as the Christchurch Performing Musicians Union and the Motor Garage Proprietors Association; as well as every other imaginable organisation. (N.A. W1 14/23)

†Until electricity and modern machinery improved the conditions in which tunnellers had to work, life could be very unpleasant underground. In his "Notes" Peter Keller describes his first tunnelling job on the North Island main trunk. "The country was 'papa' the all-pervading rock of the district—consolidated old sea-mud. And to mud it reverted on the floor of the tunnel, under the influence of rainwater and seepages and the puddling it got from horses working there. For our work putting in centre pegs (and centre tacks therein) sighting and reading the instruments, we had nothing better than candles—acetylene lamps came later. For working the tip-head outside during night shifts, a type of pressure kerosene flares, known I think as Wells Lights, were relied on. Putting in the centre pegs in the filthy mud was a slow and unpleasant job, not improved in any way by the horse droppings and the stench left after months of working."

As well as constructing tunnels, viaducts, and other structures necessary to cover the country with railway lines, the Public Works Department had the ultimate responsibility for naming stations. Sometimes this was delegated to local committees, at other times the Minister was receptive to suggestions from local, loyal Parliamentarians. The task was not an onerous one and public interest in the exercise fluctuated. There were times when a name could cause considerable controversy—an event relished by few Government departments. In July 1914 a petition from residents at Parikawa, Clarence, requested that the name of the station on the South Island main trunk, about 2 miles south of the River Ure be changed from Mills.⁵⁹ The department had adopted the name in honour of a Member of Parliament from the district. The petitioners (some 40 in number) argued that “alterations of old names are exceedingly distasteful” and that the station should be called “after one of the old Maori names or after flora characteristic of the neighbourhood”.⁶⁰ After consultation the Minister decided to change the name to Wharanui. In another station naming incident D. O. Haskell recalls a tale told by his father of the difficulty faced by the local inhabitants of a North Canterbury district. They set up a committee which failed to agree on a name. One of its members was very late and those already present agreed that on his arrival his first words would be adopted as the place name. On his arrival, and before he could say a thing, the chairman told him of the committee’s decision. His immediate reply was “No! not I”. And, believe it or not, “Nonoti” was adopted.⁶¹ D. O. Haskell himself saw the name on the small station during the thirties. It is still an official name listed in the *Gazetteer* and shown on maps.

The continuing emphasis on railways tended to overshadow two other important and increasingly significant Public Works Department activities—roading and the development of hydro-electric power. In 1893 a speaker in Parliament declared that “there was no question that the policy of the country at the present time was—roads, roads, roads”.⁶² Yet in 1916 the Engineer-in-Chief told the New Zealand Society of Civil Engineers that “the users of roads in this Dominion do so, in most instances, at considerable risk of life, limb and property”.⁶³ Later he claimed that although the construction of roads was probably the most important work which confronted the colonists after their arrival, “this is probably the only work in which no progress has been made as regards quality, but only as regards quantity”.⁶⁴

The Department’s relationship to roading was a complicated one and its responsibility was not always a direct one. For almost two-thirds of the period under consideration in this chapter, roading was not the responsibility of the Public Works Department. During this time significant developments were occurring which warranted a serious re-evaluation of the place of roads in the country’s public works. As Engineer-in-Chief R. W. Holmes observed

in 1916, railway construction had dominated public works policy since 1870.⁶⁵ In justification of this he pointed out that particularly in the North Island "the construction of good roads, owing to the scarcity of proper materials and the unstable nature of a great part of the country, is more difficult than the construction of railways. Railways are actually, in many districts, assisting in the construction of the roads which feed them."⁶⁶ However as early as 1891 preference was being shown to the traction-engine rather than the railway as a method of transport for farm produce, especially wool.⁶⁷ This had two results—it reduced even further the profitability of the railways, and it ruined roads built to withstand only the horse and buggy. By 1897 matters had deteriorated still further. In forest areas timber carriers were accused of destroying the lightly constructed roads,⁶⁸ and by 1903 a new menace was apparent. Dairy factories were springing up everywhere. There was no alternative to road transport for the milk from the surrounding farms. But now the demand was for metalled roads because rapid and reliable transport was essential if the industry was to be efficient.

When roading work, taken from the Public Works Department in 1889, was returned to it in 1909* its powers to remedy the existing inadequacies were at best limited. It exercised complete control over very few of New Zealand's roads. Basically there were two divisions. The Public Works Department designed and built all roads which were completely paid for by the Central Government, then handed over to the local authorities for maintenance. District roads were built by the local bodies, financed by rates and occasional Government grants. Where Government finance was involved the Public Works Department had to inspect the work. At the best of times few local bodies adequately maintained their roads. When exceptionally bad weather occurred and it was accompanied by floods, by no means infrequent in New Zealand, they found it impossible to cope. 1917 for example was a bad year. Because of "extraordinary and continuous rainfall"⁶⁹ throughout the year an enormous amount of damage was caused to roads and bridges. According to the Public Works Statement "the country became waterlogged, and wherever the roads had not been metalled they were quite unable to bear any traffic and soon became quagmires, causing very serious inconvenience".⁷⁰ Lack of knowledge about flood levels aggravated such situations as many bridges were built too low and were consequently damaged by rising waters. River improvement and flood control works began with the Waihou and Ohinemuri Rivers. By 1920 the Rivers Commission was reporting regularly on rivers throughout the country. The Public Works Department was responsible for implementing the reports at Government direction. Given the nature of the countryside however, flooding will remain an expensive threat to many parts of New Zealand, no matter how sophisticated the methods to combat it become.

*The amalgamation apparently saved the country a minimum of £30,000 per annum in administrative costs. (*AJHR*, 1909 Session II, Vol. II, D-1 p. xv)



The original caption reads: "After Fifty Years! Bugged Mail Coach. Bullocks to the Rescue. Main Road Maungaturoto 1912." *Weekly News*.

Only 60 years ago. The first car to make the journey by the direct route between Wellington and Auckland is assisted to bypass a broken bridge. *Turnbull Library*.

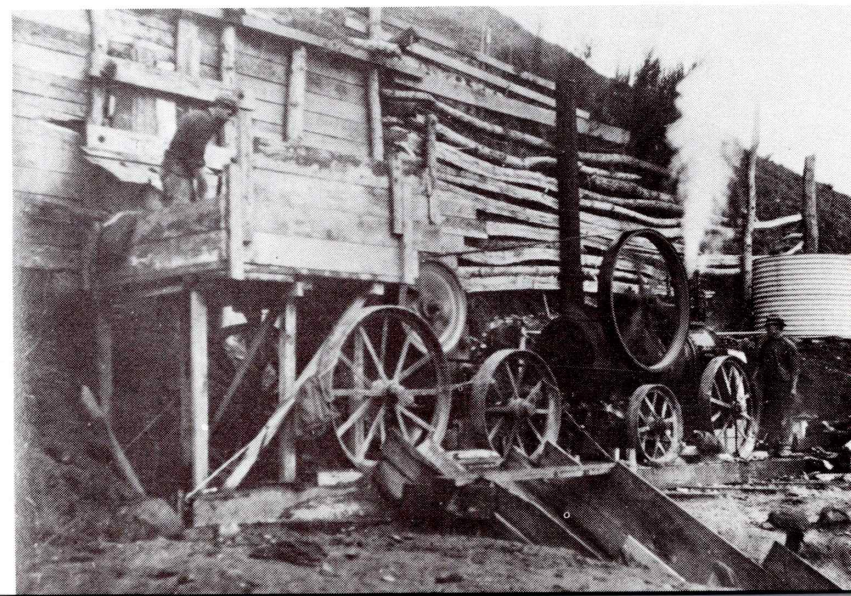
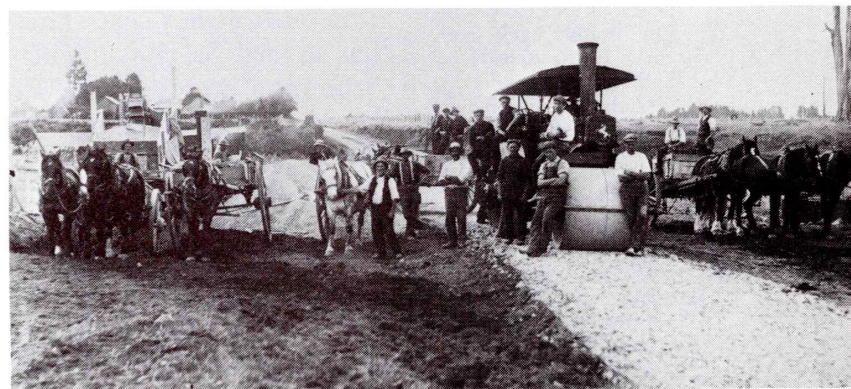
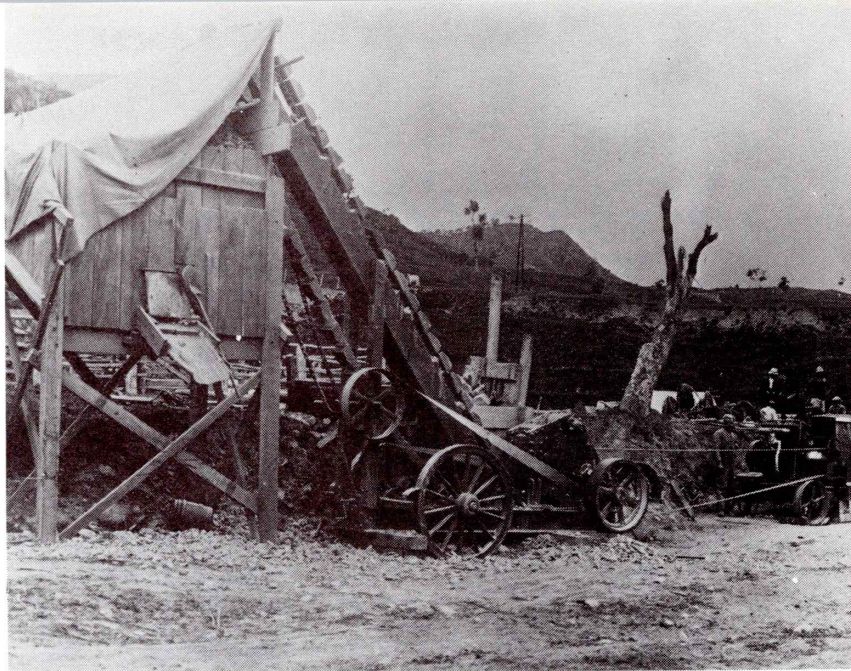


RIGHT TOP: Metal crusher and elevator on road improvements, East Coast, about 1907. *F. A. Hargreaves Collection. Turnbull Library.*

RIGHT MIDDLE: Steam roller, drays, and elevator. A metalling team on Bream Road, Taranaki in 1912. *McAllister Collection. Turnbull Library.*

RIGHT BOTTOM: Traction engine driving a metal crusher. Improvements to Wairoa Waikaremoana road, 1922. *J. H. Christie.*

BELOW: Operating wheelbarrows over rough ground calls for ingenuity. *Turnbull Library.*



A GOING CONCERN

*R. W. Holmes must rate as one of the most administratively efficient of engineers-in-chief. He himself prepared a whole set of pamphlets standardising many aspects of his engineers' work. One entitled "Plan Lettering" even gave examples of desirable hand-lettering. The New Zealand Society of Civil Engineering recommended their use to all its members. (*NZ Soc. Civ. Eng. Proceedings, 1914-15*, Vol. I, pp. 195 and 196 I.

†There were some cases where the erection of sub-standard bridges was justifiable. The important criteria were low traffic density and alternative crossings for heavy vehicles. On many back country roads traffic density is low and stream crossings easily forded by traction engines and other heavy traffic, but not by motorcars and light horse-drawn vehicles. Light bridges would give the latter classes of vehicle all weather access at reasonable cost while the heavy vehicles could still get through except in times of very high floods.

‡The Electric Lines Act of 1884, various Acts establishing the Crown's rights over water rights, and the Electrical Motive-Power Act 1896 were the basis of the State's attitude to hydro-electricity in New Zealand. For further details see Pickering, B.B.M. "State Policy and Hydro-Electricity in New Zealand (1884-1925)" M.A. thesis 1949, Univ. of N.Z. Otago College. He points out that the Water Power Act was new in its implication that the Government itself intended to enter the field as a producer of electricity.

Continued on p. 91.

As long as roads remained the preserve of the local authorities there was little the Public Works Department could do except warn and exhort. Holmes,* who was well aware of the increasing importance of roads, while others continued to delude themselves about the primacy of railways, constantly tried to draw attention to the existing state of affairs. As late as 1917 he decried the lack of attention given to the maintenance of roads.⁷¹ Bridges, he maintained, were in many cases so unsafe that it was only through sheer force of habit that they stood up.⁷² He instanced a case in the north where he was asked to advise on its safety. On doing so he was horrified to find that several panels of the lower chords of the timber trusses had rotted through, and, in two instances, had disappeared altogether, and yet no steps whatever had been taken to stop traffic or provide against a collapse. He commented "I have often wondered why that bridge supported even its own weight".

What was even worse, according to Holmes, was the construction of roads capable of carrying traction engines, but with bridges made purposely narrow so the heavy vehicles could not use them and they could therefore be built at less cost. This occurred even where there was no alternative such as a ford or convenient detour for heavy vehicles.† The practice, not uncommon among local bodies, in effect prevented the roads being efficiently used by contemporary machinery.⁷³ A solution to such problems was not found before 1920.

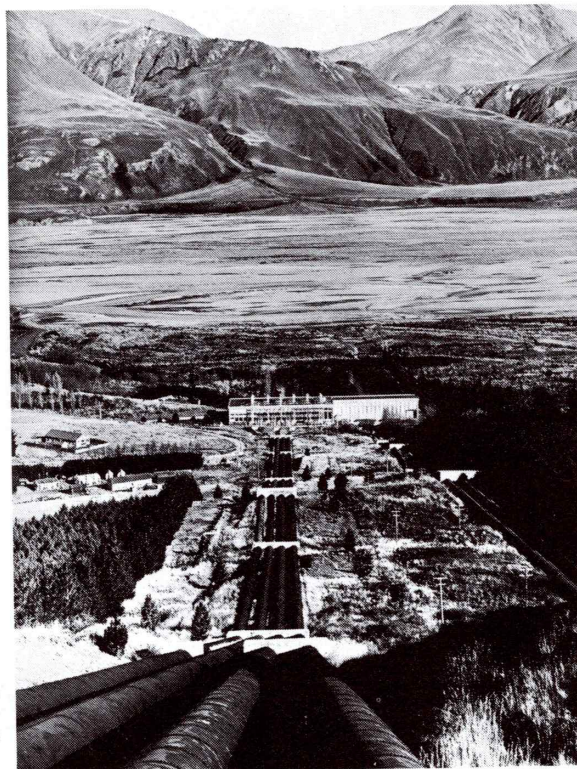
In the field of hydro-electric development the situation was, happily, very different. In the latter part of the nineteenth century the Mines Department had been instrumental in keeping the latest advances in hydro-electricity before the public and the government. With the 1903 Water Power Act‡ however it officially became an area of concern for the Public Works Department. Even before the Act was passed a survey of New Zealand's hydro resources was being made, by an American expert L. M. Hancock.⁷⁴ His summary was followed up by a detailed report from P. S. Hay at the time Superintending Engineer with the Public Works Department.§ The decided conclusion of both men was articulated by Hall-Jones in the 1904 statement:

"So many great and potential schemes lie ready to our hand that we are embarrassed by their number and variety. It therefore becomes a matter of difficulty to determine where to begin in the matter of their utilisation."⁷⁵ The 1903 Act reserved the development of hydro-electric resources to the State. But it was some time before the government of the day saw fit to proceed. In 1907 it announced "that the time for embarking on these undertakings, which would amount almost to a fresh public works policy, has perhaps hardly yet arrived".⁷⁶ Some delay in implementing Hay's 1904 report is understandable. The whole of the Public Works budget for 1903-04 was £1,777,465.⁷⁷ To develop 70,000 horsepower at Lake Coleridge (one of Hay's recommendations) was to cost £1,059,000 alone. However Hall-

Jones and Hay both ensured that investigative work continued while the Government awaited the appropriate time to proceed. In the meantime some water power was made available to private enterprise for use.⁷⁸ Then in 1910 the Government decided that the time had finally arrived “to take up with vigour the question of developing our abundant water powers”,⁷⁹ and a sum of £300,000 was placed on the estimates to allow “an energetic commencement to be made”.⁸⁰ The first step was the appointment of an electrical engineer, who took up his post in July 1911. By March 1915 the Public Works Department had established and begun successfully operating the first public hydro-electric scheme at Lake Coleridge in Canterbury. The department set about actively selling electricity to the municipality of Christchurch, to its industries, and to private consumers. It hardly needed to. Before the scheme had been in operation a year demand began to exceed supply. It was a tremendous success but even so hydro development was to progress rather slowly from this point. However as Pickering points out in his thesis most of the major decisions on New Zealand’s development of hydro-electricity were taken before 1920. In 1918 Chief Electrical Engineer Evan

Continued from p. 90.

§This report is regarded as a classic of its type. P. S. Hay a most gifted engineer did not live to see any of the schemes he recommended completed. He died in March 1907 after an all too brief period as Engineer-in-Chief. (See *AJHR* 1904, Vol. II, D-1A)



Lake Coleridge powerhouse and pipelines, the first of the major Government developments. Commissioned in 1915, extension was completed in 1927. *Turnbull Library.*

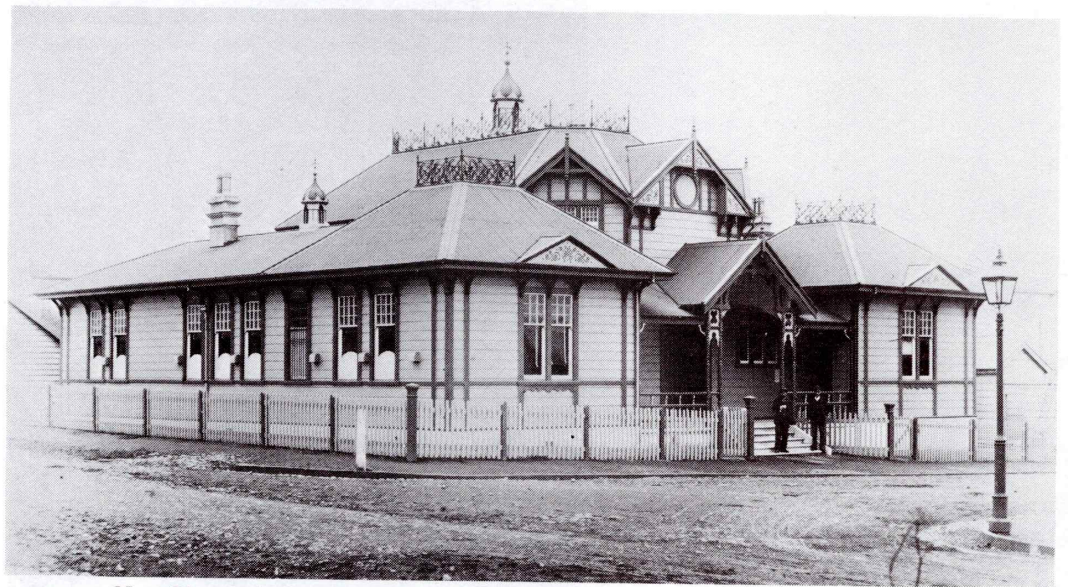
Parry submitted a comprehensive report on a complete system of interconnected power stations for the North and the South Islands.⁸¹ This must rate with Hay's report as one of the two most significant documents on hydro power in New Zealand.

The construction of railways, roads and hydro-electric projects—these were only a few of the Public Works Department's activities between 1890



Ashburton Post and Telegraph Office, opened in November 1901.

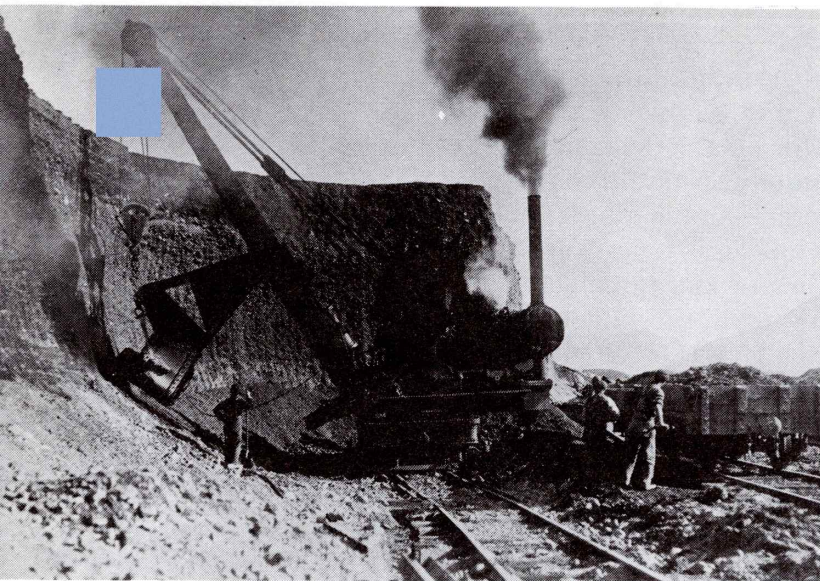
Wanganui Post and Telegraph Office, completed in 1902, picture taken in 1913. *Tesla Collection, Turnbull Library.*



New Plymouth Courthouse, completed in 1895. *Collis Collection, Turnbull Library.*

and 1920. They were being added to all the time—supervision of the electrification of tramways and initiation of irrigation schemes were two of the newcomers. It was a period of consolidation and growth for the department. The growth was far from even. From 1891 to 1896 Seddon constantly reiterated the need for the utmost economy in public works—and he practised what he preached. In 1896 expenditure began to rise but Hall-Jones warned the country against expecting this situation to continue. In fact he said that when the Eketahuna Railway was finished, “and the other pressing works in connection with the lands improvement, roads to open lands for settlement, the drainage of Rotorua, the development of our thermal springs and gold-fields, and the making of our natural scenery accessible to the world”, then expenditure on public works would be reduced to the lowest possible limit.⁸² By 1900 however he was optimistically predicting that the time had arrived to carry out public works more vigorously than had been the case since 1887.⁸³ But a fluctuating economy meant that in 1903 a reduction in expenditure was again necessary.⁸⁴ And so the pendulum kept swinging. World War I caused a severe labour shortage in New Zealand from 1917 to the end of the decade, and this in turn restricted public works activities. But it had a positive effect as well—it prompted the department to accelerate its first steps towards mechanisation. Of all the Government departments, Public Works seemed the most vulnerable to economic conditions. Nevertheless the overall result was growth, and nowhere was this more obvious than in the architectural division.

The future of an architectural section within the department had been shaky since Burrows was dispensed with in 1884. Before that, the failure to appoint a colonial architect to succeed Clayton had effectively downgraded architectural services. After Burrows left a draftsman was regarded as all that was necessary to look after specifically architectural duties. Responsibility for the actual construction and maintenance of public buildings devolved on the various local engineers. But this arrangement was far from satisfactory. In 1889 engineer Arthur Bell was given overall responsibility for public buildings and his only report on the matter was a scathing indictment of the state which most buildings had been allowed to get into.⁸⁵ Furthermore hygiene and sanitary methods had advanced considerably in the last quarter of the nineteenth century and few public buildings had been designed with the innovations—most needed to be drastically overhauled. Fire precautions were apparently almost non-existent despite the timber content of most public structures.⁸⁶ Among Bell's recommendations was a suggestion for a uniform colour scheme to distinguish Government buildings.⁸⁷ After public buildings had been transferred back to the Public Works Department things began to improve. John Campbell was in charge (though his initial position was only that of draftsman), and he remained at the head

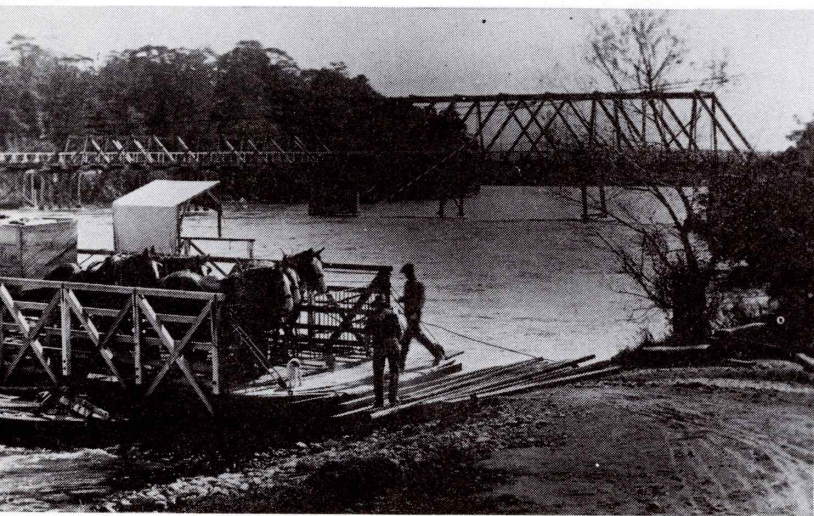


ABOVE: Steam navvy loading ballast wagons near Cass Station on Midland railway. From 1910 D-1, print with Turnbull Library.

BELOW: The ferry over the Waiau which served for many years is about to be replaced by the bridge. Turnbull Library.

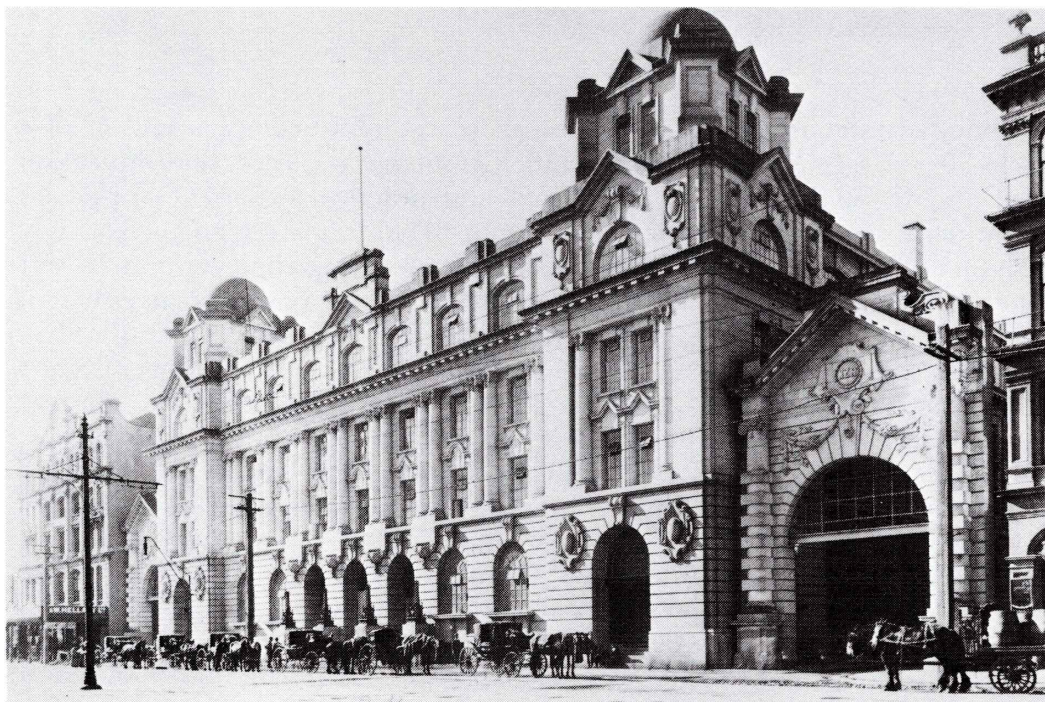
RIGHT TOP: Castlepoint lighthouse, erected in 1912. This was the last watched light imported from England. F. W. Young.

RIGHT BOTTOM: The Farewell Spit lighthouse, erected in 1896. This steel tower replaced one of timber built in 1870. Tyree Collection. Turnbull Library.



of the section until 1922. Under his steady guidance the architects were able to establish themselves as an important and permanent part of the Public Works Department.

The competition for the design of Parliament Buildings was probably the outstanding architectural event in this period. The winners were none other than John Campbell and one of the department's junior architects Claude Paton.* The Government had safeguarded itself against criticism at civil servants being allowed to enter by circularising all departments beforehand that no work on entries was to be done in office hours.⁸⁸ But Parliament Buildings was not Campbell's only impressive design. The Law Courts in Dunedin, the Magistrate's Court, the Public Trust Office, and the Post Office in Wellington, and the Central Post Office in Queen Street, Auckland, are only some of the many buildings from the period which are witness to Campbell's beliefs in a definitely "official" style of architecture. Government House in Wellington and the former Hermitage at Mount Cook are examples of a more relaxed approach to buildings designed for living and relaxation. The Bath House in Rotorua is another interesting example from the period and though not designed by Campbell, it was approved and supervised by him.



General Post Office, Auckland. Opened early 1913. Entrances to old Railway Station on either side. *Auckland Star Collection. Turnbull Library.*

*Campbell also won fourth place in the same competition in conjunction with another architect C. A. Lawrence.



Public Trust Building, Wellington. Completed 1909. *Turnbull Library*.

Public works construction at all levels became more complex and diverse in the 30 years from 1890. Senior staff members recognised that education based on the Civil Service examinations and practical experience provided by the department were not going to equip technicians for an increasingly mechanised future. The pattern had been for an aspiring engineer or architect to join the department in a clerical capacity. When positions in either of these fields were available cadets were chosen from amongst the staff. They were then expected to pass the Senior Civil Service examination within 4 years of beginning their cadetship.⁸⁹ The great disadvantage was that at least until the mid-1900s the syllabus was limited in technical subjects. An engineering cadet could, for example, present Latin, history, and precis English for the examination as the cadetship training was regarded as distinct from the examination system. Passes in such subjects as mathematics however improved chances of selection for an engineering cadetship. While there was no doubt that the broader the education, ultimately the better the engineer, more specialised training was clearly required. After a considerable struggle R. W. Holmes finally obtained for cadets the right to apply for 2 years leave to study engineering at Canterbury University.⁹⁰ Even this did not provide enough time to complete a degree but it was a step in the right

direction. The war and economic circumstances resulted in the scheme being suspended and it was not reinstituted until 1923.*

Although the years 1890–1920 were on balance positive ones for the department, there were, by 1920, a growing number of unresolved problems. In these 30 years there had been few basic changes and the important ones had all come in the early 1890s. Clearly the time was coming when the activities of the department would have to be carefully re-evaluated.

REFERENCES CHAPTER 4

1. *NZPD*, Vol. 67, 27 June 1890, p. 161.
2. *Ibid.*
3. *Ibid.*, Vol. 68, 17 July 1890, p. 13.
4. *Ibid.*, Vol. 69, 15 August 1890, p. 23.
5. The author is grateful to J. H. Christie who made a detailed examination of staff records from 1887 to 1892.
6. *NZPD*, Vol. 68, 17 July 1890, p. 14.
7. *Ibid.*, Vol. 69, p. 24.
8. *Ibid.*, p. 544.
9. Oliver, p. 156.
10. *NZPD*, Vol. 74, 11 September 1891, p. 561.
11. *Ibid.*, Vol. 82, 26 September 1893, p. 706.
12. *AJHR*, 1891, Session II, Vol. II, D-1, p. 2.
13. *Ibid.*, p. 3.
14. *NZPD*, Vol. 74, 11 September 1890, p. 560.
15. N.A. W14/2, p. 70.
16. *Ibid.*, W4, 42/09.
17. *AJHR*, 1899, Vol. II, D-1, p. iii.
18. *Ibid.*, 1895, Vol. II, D-1, p. v.
19. *Ibid.*, p. vi
20. *Ibid.*, 1896, Vol. II, D-1, p. vi.
21. *Ibid.*, 1877, E-1, Enclosure No. 1, p. 55.
22. *Ibid.*, 1883, Vol. II, D-1, Appendix J, p. 58.
23. *New Zealand Official Yearbook (NZOY)*, Wellington, 1894, p. 234.
24. The following section is based on *AJHR* 1891, Session II, Vol. II, D-1, p. 5, and an account of the co-op. system in *NZOY*, Wellington, 1894, pp. 234–242.
25. *Ibid.*, p. 238.
26. *AJHR*, 1891, Session II, Vol. II, D-1, p. 16.
27. *NZOY*, 1894, p. 235.
28. *New Zealand Listener*, 25 October 1971, p. 15.
29. *NZOY*, 1894, p. 237.
30. *NZPD*, Vol. 77, 25 August 1892, p. 362.
31. *Ibid.*, p. 364.
32. *Ibid.*, p. 367.
33. *Ibid.*, p. 368.
34. *AJHR*, 1903, Vol. II, D-1, p. viii; see also *AJHR*, 1896, Vol. II, D-1, p. v.
35. N.A. W4 27/1911.
36. *Ibid.*, 13/1898 and plan P.W.D. 18319.
37. *Christchurch Press*, 8 November 1910.
38. N.A. W4 31/08.
39. *Christchurch Press*, 11 October 1910
40. *Lyttelton Times*, 11 October 1910.
41. *Ibid.*
42. N.A. W1/5 11/4735.
43. *Christchurch Press*, 12 October 1910.
44. Waterson, D. B. "Railways and Politics, 1908–1928" Univ. of N. Z., Auck. College unpubl. M.A. thesis 1959, p. 133.
45. *NZPD*, Vol. 77, 25 August 1892, p. 369.

*In 1922, as a third-year engineering cadet, J. H. Christie applied for leave to attend at Canterbury but was informed no staff could be spared to attend lectures. The following October he was in Wellington to sit an Institution of Civil Engineers examination and called on F. W. Furkert, the Engineer-in-Chief. During conversation he asked him whether engineering staff could still attend the university lectures. "Of course they can!" replied Furkert, never one to beat about the bush. Not long afterwards a circular went out inviting nominations to attend the session at Christchurch the following year, and in March four from the department, E. R. McKillop, T. M. Wright, A. C. Jenkins and J. H. Christie, were sent to Canterbury University. Others followed in subsequent years.

46. N.A. W4 10/96.
47. *AJHR*, 1896, Vol. II, D-1, p. iii.
48. N.A. W1/3, 1910/7472, 27 August 1909.
49. *Ibid.*, 12 February 1910.
50. N.A. W4, 30/09.
51. *NZPD*, Vol. 151, 1910, p. 654, quoted in Waterson, p. 11.
52. *AJHR*, 1900, Vol. II, D-1, p. i.
53. What follows is based in part on the notes of Peter Keller, one time district engineer at Dunedin. He worked as a cadet and then assistant engineer on the North Island main trunk.
54. Keller, P. "Notes", a copy of which is now deposited in Ministry of Works library, Wellington, p. 18.
55. *Ibid.*, p. 19.
56. Furkert, F. W. "Putting through the Main Trunk" *New Zealand Engineering*, 10 August 1948, p. 778.
57. *Ibid.*
58. This section is based on a Public works file N.A. W1, 14/23.
59. *Ibid.*, 12/38.
60. *Ibid.*
61. Haskell, D. O. "Notes", copy deposited with Ministry of Works library, Wellington.
62. *NZPD*, Vol. 81, 15 August 1893, p. 51.
63. *New Zealand Society Civil Engineers Proceedings*, 1915-16, Vol. II, p. 33
64. *Ibid.*, 1916-17, Vol. III, p. 31.
65. *Ibid.*, p. 35.
66. *Ibid.*
67. *AJHR*, 1891, Session II, Vol. II, D-2, p. 3.
68. *Ibid.*, 1897, Vol. II, D-1, p. xi.
69. *Ibid.*, 1917, Vol. I, D-1, p. i.
70. *Ibid.*
71. *N.Z. Soc. Civ. Eng. Proceedings*, 1916-17, Vol. III, p. 32.
72. *Ibid.*, 1915-16, Vol. II, pp. 33-34.
73. *Ibid.*, 1918-19, Vol. V, p. 293.
74. *AJHR*, 1903, Session II, Vol. II, D-1, pp. xiii-xiv.
75. *Ibid.*, 1904, Vol. II, D-1, p. xiii.
76. *Ibid.*, 1907, Vol. II, D-1, p. xi.
77. These details are from Pickering, B. B. M. "State Policy and Hydro-Electricity in New Zealand (1884-1925)" Univ. of N.Z., Otago College unpubl. M.A. thesis, 1949.
78. *AJHR*, 1907, Vol. II, D-1, p. xi.
79. *Ibid.*, 1910, Vol. II, D-1, p. viii.
80. *Ibid.*, p. ix.
81. Pickering, pp. 114-115 and *AJHR*, 1918, D-1A.
82. *AJHR*, 1896, Vol. II, D-1, p. iii.
83. *Ibid.*, 1900, Vol. II, D-1, p. i.
84. *Ibid.*, 1903, Vol. II, D-1, p. 1.
85. *Ibid.*, 1890, Vol. II, D-1, p. 30.
86. *Ibid.*, pp. 30-35.
87. *Ibid.*, p. 31.
88. N.A. W4 15/1911.
89. N.A. W1 1913/2710.
90. *N.Z. Soc. Civ. Eng. Proceedings*, 1914-15, Vol. I, p. 32.

CHAPTER 5 / *A New Vigour*

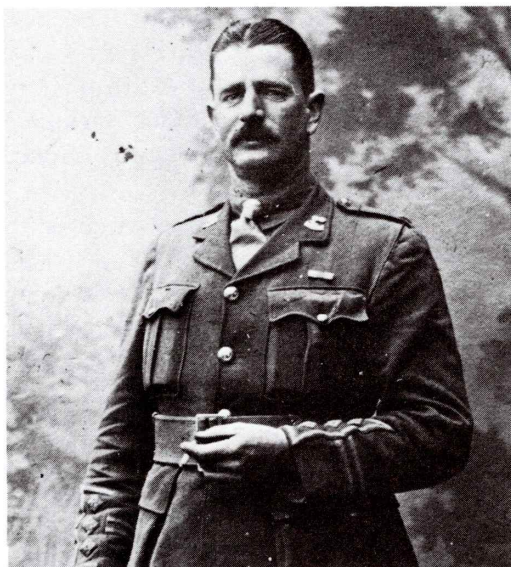
“Don’t you know Mr Hamilton that Public Works engineers are the best engineers in the world!”

“Mr Haskell I’ve heard it before and it was a Public Works engineer who said it.”

Doc. Haskell, Public Works Department engineer to Mr Hamilton a Scottish engineer with Armstrong, Whitworth. Ministry of Works, Tape 1, Side 1, Track 2. (Interview with Joe Wright.)

1920 saw the appointment to office of two men who were to have a decisive influence on the Public Works Department in the following decade. They successfully rationalised public works construction in New Zealand only to see the depression of the thirties destroy much they had accomplished. Joseph Gordon Coates became Minister of Public Works in April 1920. In August Frederick William Furkert became Engineer-in-Chief and Under-Secretary, and thus permanent head of the department.

Coates owed his appointment as much to the fact that he was both a returned soldier and a farmer, two groups on whom his Reform Party relied



Joseph Gordon Coates (1878–1943), Minister of Public Works, 1920 to 1926 and 1931 to 1933. *Turnbull Library.*



Frederick William Furkert (1876–1949), Engineer-in-Chief and Under-Secretary 1920 to 1932. *Ministry of Works.*

for support, as to any foreknowledge of his abilities as a Minister and administrator. The widespread approval of his appointment was in large measure due to the unpopularity of his predecessor. It has been written of Sir William Fraser that no Minister for Public Works has ever faced such sustained criticism; that not only did Fraser "continue the old tactics of using railways as election bait, but he failed to evolve a co-ordinated policy of construction, continued the building of South Island branch lines on extremely dubious economic bases and was reluctant to adopt new techniques".¹ Certainly he bequeathed to his successor a number of problems, though not all were of his making. The two areas requiring immediate attention were labour relations and political influence on public works planning. According to the Mayor of Christchurch "the country had suffered from old-age Ministers" but the "keen, bright, new, young Minister of Public Works . . . was a lively man amongst them".² Coates seemed to confirm this opinion as he began to tackle the basic problems affecting public works throughout the country.

As an administrator Coates was noted for his ability to select gifted public servants. He cannot however claim any significant responsibility for F. W. Furkert's appointment as head of the Public Works Department. Furkert had clearly established his claims to the position before Coates appeared on the scene. He had joined the department in 1894, at a time when economic conditions restricted openings for new staff. Fortunately for Furkert he was a West Coaster and Seddon was then Minister of Public Works. "It was a pleasure," Seddon wrote to his father G. W. Furkert, "to offer your son an appointment in the Public Works Department where I feel sure he will do justice to himself and be a credit to his worthy parents. Our West Coast youth on the whole have come out very creditably in respect of examinations which have been passed from time to time and when in the Civil Service I am sure they will not do anything discreditable to the district from whence they came."³

Few departmental heads either before or since have inspired their staff with the same mixture of respect, admiration and wariness. F. W. Furkert was a widely read, cultured man who expected his staff to be able to keep up with him. The story is told of a newly appointed engineer on a section of railway in Nelson desperately absorbing all the details he could about the job before an inspection visit from Furkert. As soon as he arrived they started out down the line on a jigger. They had not gone far when Furkert ordered a halt. He leapt off the jigger, picked a small flower off the nearby embankment and asked the local engineer what it was. The latter had no idea. Furkert told him its botanical name, its common name, and listed other points of interest about it. On the trip down the line he frequently stopped and asked similar questions. Not once did he ask about the work on the line. At the end of the trip he upbraided the engineer for his lack of botanical

knowledge and asked him why he did not take some interest outside his job.⁴ He was also capable of a genuine and kindly interest in the lives of his subordinates, particularly departmental cadets and young engineers.⁵ As engineer-in-chief he preferred to be in the field, where the action was, rather than remain at his desk; as under-secretary he tried hard to have engineers' salaries upgraded; and as head of the department he fought desperately to keep it intact when Government policies in the early thirties swept away its *raison d'être*.

The first problem he and Coates faced together was shortage of labour. This was no simple problem of numbers. It affected the department at all levels. During World War I more than half of the department's engineers were overseas. Those who did return were faced with much more attractive salaries in private employment. Coates himself acknowledged that the department had lost many of its best men to private enterprise but he saw no immediate remedy.⁶ There continued to be a lack of skilled tradesmen even after the war* as well as a serious shortage of unskilled labourers. The situation was expected to end with the return of the servicemen but many were not fit for heavy outdoor work. On top of this the influenza epidemic actually forced some fully staffed projects to be closed down. Actually the department went to some trouble to place returned servicemen, even those whose injuries hampered their abilities, especially where they had worked for the Public Works Department before the war.⁷ To further aggravate the position, there was a desperate shortage of materials.⁸ The rundown of the department's service during the war meant that it was simply not geared to cope with a sudden influx of manpower. The district engineer in Dunedin wrote to head office in August 1918 that he had had "an abnormal number of applications for employment lately," that the majority of the applicants were returned soldiers, and that he was still receiving applications for jobs. He had work available but he simply could not house the men in the required numbers.⁹ Living conditions for the ordinary workman on many of the Public Works Department's projects were so unsatisfactory that even when accommodation was available the department had some difficulty in keeping men on the jobs. Members of Parliament who visited the camps at Mangahao early in 1920 for example told of "men living in tents in the heart of the bush without floors or fires, slushing about in the mud and the muck and with no provision for drying clothes".¹⁰ At places like Otira, and on the North Auckland main trunk and the Stratford line, workers often had no dry clothing for weeks on end and cooking was restricted by the vagaries of the weather.¹¹ By 1920 conditions and pay for public works employees put them amongst the worst off in the country.

The situation was aggravated by two further factors. One was the dispersal of what labour force there was over a multitude of jobs. On railway works

*In March 1919 Fraser told a Member of Parliament that the Public Works Department could not proceed with the Culverden-Waiiau Railway because the job required another platelayer and there was not one available anywhere in the Dominion. (N.A. W1 13/4.)

the problem was particularly acute with workmen scattered along miles of line instead of being concentrated to enable economic provision of facilities and conveniences.* The second factor was the failure to implement an adequate programme of mechanisation.

In his first annual report as Minister of Works, Coates announced his Government's intention to mechanise the department. The day of the pick, shovel, wheelbarrow, horse, and dray, did not vanish overnight. Tunnellers were the first to benefit as air compressors and special rock drills began to replace the hammer and gad or the hand drill. But the steam shovel and the small locomotive with its rake of trucks gradually became a familiar sight on public works projects. Reversion to manual labour during the depression in the thirties detracted from this particular achievement. By 1925 the department had 30 steam shovels; 5 dragline excavators; 47 locomotives—steam, petrol, and electric; 80 motor lorries; 16 tractors; 20 concrete mixers; 22 power-driven winches; 13 air compressors; 19 stone crushers; 13 road rollers; bitumen boilers and sprayers, and a large array of machine tools, steam boilers, motors, cranes, and the other minor machines necessary for the



*C. M. Herbert in his thesis on public works camps gives an example of this: In 1920 in North Auckland alone there were 25 men engaged on the Waipu branch, 66 on the Kaihu extension, 107 north from Ngapuhi, 22 north from Waiotira, 145 south from Waiotira, 179 men north from Ranganui, and 91 men on the Whangarei branch. (Herbert, p. 23.)

Railway construction in Taranaki. *McAllister Collection. Turnbull Library.*



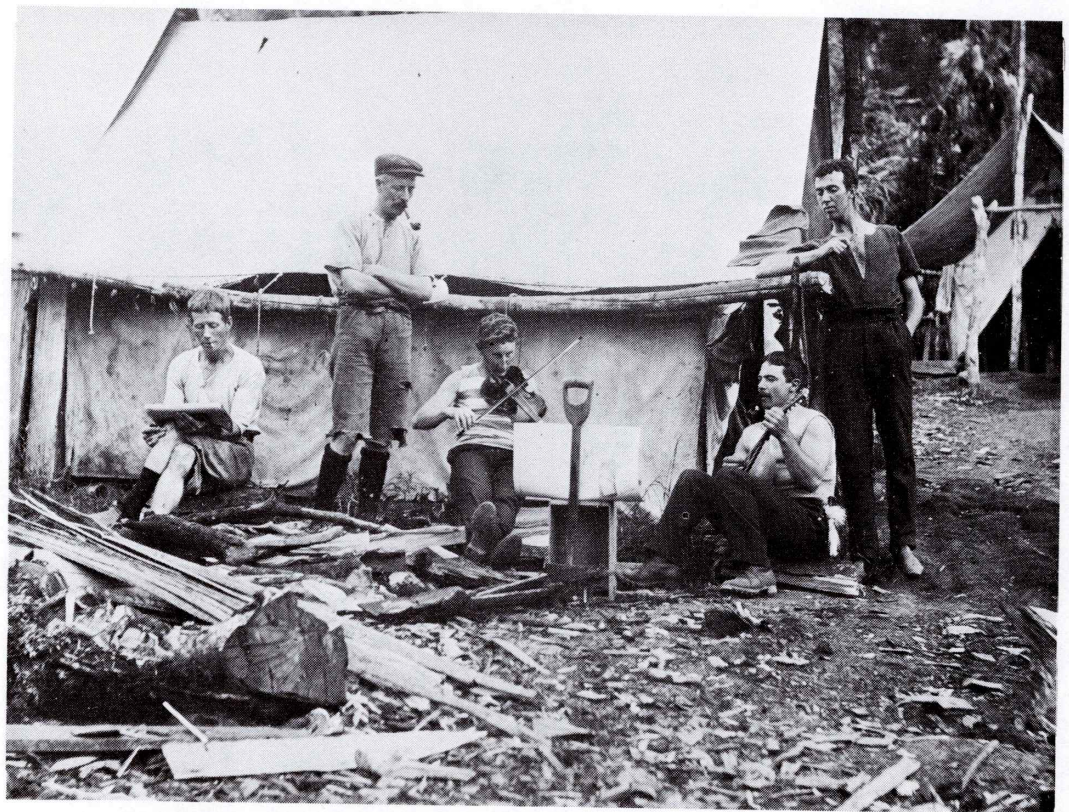
The bush tramline with timber rails feeds traffic to the railway. *Turnbull Library.*



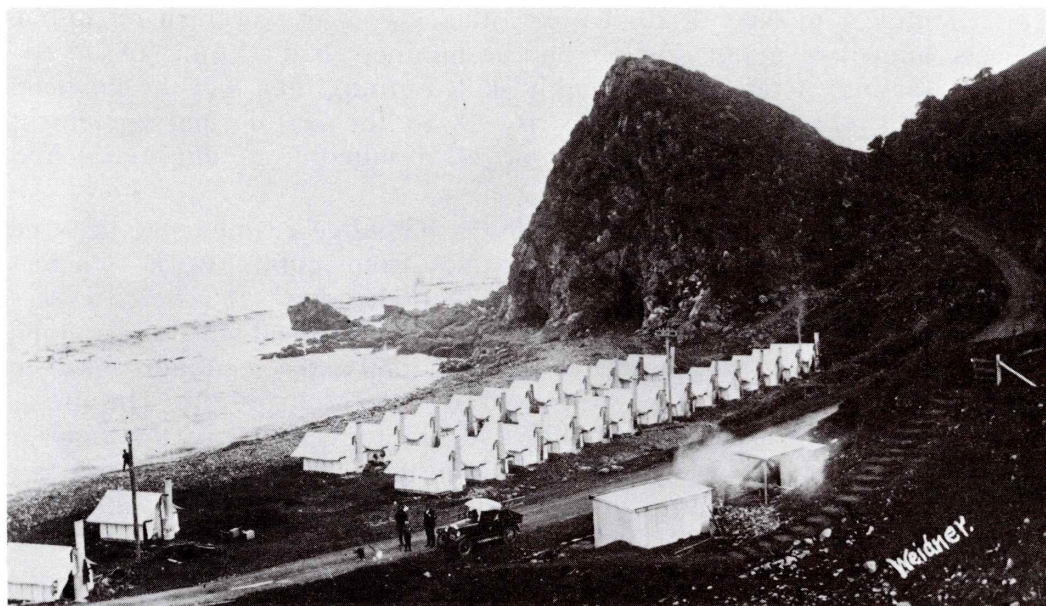
Excavating a cutting on the Palmerston North railway deviation. Compare this shovel with the 1910 machine on page 94. Taken 1927. *Evening Post. Turnbull Library.*

successful operations of the larger units.¹² No sooner had mechanisation got under way than the country was faced with an economic recession and the subsequent surplus of labour. However it proved to be a process that only a really serious depression could reverse, not least because it reduced costs significantly, particularly in areas like earthwork, where expenses were estimated to have dropped by 30 percent.¹³

Mechanisation alone would not solve the Public Works Department's labour problems and Coates made it clear that he intended to take positive steps to retain manpower by improving working conditions. The growing strength of unionism amongst the department's employees reinforced the need for such steps. In 1919 the Pastoral Workers Union absorbed several small public works unions and changed its name to the New Zealand Workers Union.¹⁴ Organisers appointed by the new union were successful in consolidating its position amongst public works employees. The union's position was further strengthened when the Tunnel Railway Construction Workers



Relaxation in a survey camp. Visitors are not expected. *National Publicity Studios.*



Construction camp near Kaikoura, probably for railway works. *Turnbull Library.*

Survey camp near Tuai after light snowfall during investigations for Waikaremoana power scheme. 1921.



Union joined it in May 1920. Unlike other classes of workmen on public projects, tunnellers, many of whom had been miners, had a history of successful union action. A tightly knit, highly skilled group, they had the financial and moral strength to sustain a strike.¹⁵ So the first formal agreement between the department and its employees resulted from ministerial and union initiatives.

The agreement reached in the middle of 1920 after a conference between departmental engineers and representatives from public works schemes throughout the country was remarkably comprehensive.* It covered everything from hours of work and rates of pay, to medical and educational facilities. It laid the basis for a policy of co-operation and consultation between engineers in charge and union representatives on each project. The union was to ensure that its members adhered to the agreement. In the case for example where a worker was suspected of misusing or damaging tools or other equipment the matter was to be taken up with the local union official.¹⁶ Similarly if living quarters were left in a dirty state the union was to deal with the offender.¹⁷ This aspect of the agreement suggests that the Government had simply found another way of policing and disciplining its employees. But other clauses in the agreement revealed a far more accommodating spirit. All minor disputes were to be settled by the local engineer and representatives of the union.¹⁸ Any suggestion put forward by the workmen or the union for improvement in the method of working was to be seriously considered.¹⁹ The determination of what constituted a "wet place" of work was left to the check inspector and the engineer, or the union officials and the Engineer.²⁰ Failing settlement the matter was to be referred to the Minister.† The rate to be paid for horse hire, often a significant expense for the men, was to be decided by the district engineer, the union, and the owner of the animal, and the suitability of a horse for particular duties was a matter for the union and the local engineers.²¹

In his instructions to departmental staff R. W. Holmes the then engineer-in-chief pointed out that in many respects the agreement was "a distinct departure from the practice which has hitherto obtained on the construction of public works".²² Nowhere was this departure more pronounced than in the provision of living amenities. Wherever practicable single men were to be provided with a 10 ft by 8 ft hut, with a bunk and fireplace. Married men without children were to have two rooms—one 24 ft by 10 ft, the other 10 ft by 9 ft. With up to four children the two rooms were to measure 24 ft by 10 ft, and for every additional two children a 10 ft by 8 ft hut was to be added.²³ Bathing facilities and a wash house were to be provided though they were not necessarily attached to the dwelling. Where there was no alternative to tents (either because of the temporary nature of the job or for lack of suitable materials) the men had to be supplied with frames, floors,

*For full text of the 1921 agreement see p. 316.

†In the 20 years preceding the agreement innumerable disputes had arisen over what constituted a wet place. The agreement itself attempted only the broadest definition: "generally, it is to be understood that a wet place underground will be a place where water is falling from the roof in such a way as will tend to the material discomfort of the workman by causing saturation of his clothing. It is also to be understood that there may be wet places outside on ordinary works, such as in all swamp work." (N.A. W4 24/1920.)

timber for sidewalls, and an attached fireplace and chimney. During winter months the Minister agreed to severely restrict the use of tents.²⁴ Most novel however was the willingness to provide recreation halls where there were 20 or more men employed in the vicinity. This was the beginning of the department's recognition that it was in its own interests to compensate its workmen as far as possible for the deprivations of working in isolated and unsettled areas.

The agreement seemed to herald an area of good relations between the department and its unionised employees. The department recognised its engineers might have some difficulty in adopting new methods and, perhaps more importantly, new attitudes overnight. They were instructed to accept the agreement and to "do their best to ensure its proper working".²⁵ They were reassured that they still retained "full authority to dispense with or censure a man without reference to the union, in the case of laxity or improper performance of his duties".²⁶ But the fact that this had to be stated shows how far-reaching the implications of the agreement were. It was accepted that not all points would work as desired and the engineers were promised, after the lapse of a reasonable time, a review of the whole situation. In the meantime they were requested to "deal with this subject in a broad-minded manner and use every endeavour to ensure [its] smooth working".²⁷ The obvious goodwill of the department in the whole matter was genuine. Coates himself set the tone. He frequently reiterated that only by providing "reasonable conditions of comfort and the opportunity of social amenities for the men and their families" could the Public Works Department attract and retain the best men on its works.²⁸

Enforcement however proved to be considerably more difficult than negotiation of the agreement. There were several reasons for this. In 1921 and 1922 the prosperity of the immediate post-war years gave way to economic recession with a drastic fall in the price of New Zealand primary produce on the British market. In 1921 the Public Expenditure Adjustment Act was passed to curb Government spending. Its main target was the Public Service. Government departments were forced to economise by pruning their staffs and by lowering the wages of those who remained.²⁹ Coates undoubtedly still hoped to effect the improvements promised to public works employees. But with serious financial restrictions he could not match the expectations raised by the agreement. The situation was complicated by the use of public works projects to absorb the growing number of unemployed and the consequent designation of some schemes as relief works. Relief works did not come under the agreement and New Zealand Workers Union officials believed that the Government was deliberately obstructing implementation of the agreement by reclassifying ordinary schemes as relief ones. The Public Works Department's move to comply with the Public Expenditure Adjust-

ment Act aggravated the situation even further. By dismissing employees who then had no alternative but to go on relief work, the department considerably reduced the number who qualified for improved amenities under the 1920 agreement.³⁰ However the department never faced any effective opposition to its measures because the economic conditions which caused them, seriously weakened the union. Litigation over adequate compensation for the dependants of five men killed on the Mangahao power project badly depleted the union's finances.³¹ Just at a time when increased membership was needed to offset this drain on funds, the recession not only curtailed any expansion but contributed to the union's decline.

Even had New Zealand's economy remained buoyant in the early twenties the agreement could not have been enforced without some opposition. As it was, an attempt by Coates to streamline the department's activities by further sectionalising the work and decentralising responsibility,³² meant that local engineers could interpret the agreement in their own way. So its effectiveness varied from district to district, even from project to project, depending on the attitude of the resident senior official. According to C. M. Herbert's study of public works camps between 1919 and 1949, many engineers, who preferred to be as autonomous as possible, suspected the union was simply "an organisation fostered by the Minister and head office to keep a check on their activities".³³ Despite such communication problems, Coates had obviously gone some way to improving relations between all levels of the department. In 1924 he felt it "especially worthy of notice that during the past year there has been an absence of serious difference between the department and its workers. In place of trouble there has been reason and understanding, to the mutual advantage of all concerned."³⁴

It was not in the field of labour relations but in that of public works planning that Coates claimed to depart most significantly from the policy of his predecessors. Since Vogel first initiated an extensive public works policy no Ministry had escaped accusation of political bias in determining public works programmes. Looking back over the half century from 1870 to 1920 it is very difficult to distinguish one government from another if they are assessed on the basis of how they determined their public works policies. In general terms the state of the economy and the need to open up new land for settlement and farming were the major factors. When it came to specifics however, the potential political return from a new project was carefully considered. The *New Zealand Herald* rather overstated the case, but its summary of public works policies up to 1920 reflected the views of many, particularly those who had profited least from them:

"Unfortunately, the public-works system of New Zealand has defied every maxim of business and every canon of efficiency. It has been a means for registering the influence of local agitations upon timid politicians, for per-

petuating stagnation under a thin pretence of pettifogging enterprise, and for spending money according to the dictates of political expediency.”³⁵ Coates proposed to eliminate the political element as much as possible from public works decisions. He postulated that it should be possible to determine national priorities then proceed with the most important schemes first. He opposed the piecemeal allocation all over the country of small grants to keep individual districts loyal to the ruling party. Not only did this result in a poor return on money invested, but it aggravated any labour shortage. Railways and roads were most affected by this policy. The Minister was quoted as saying about railways that his object was “to lay down a well-defined system which would ensure the speedy completion of any lines taken in hand.”* The idea was to concentrate on completing the unfinished main lines. The principles Coates enunciated were enthusiastically received. A *Dominion* editorial similar to many published throughout New Zealand was generous in its praise of Coates:

“In pledging himself to some very necessary reforms in public-works policy, Mr. Coates has courageously taken the bull by the horns. . . . No Public Works Minister has previously had the courage to attempt this, and it will only be by strong public support that it will be possible to adhere to a policy of concentration.”³⁶

In fact the pressure on Government to supply public works to districts in return for political support was as strong as ever during the twenties. Whatever Coates’s intentions he was not able to persuade his colleagues in Cabinet to completely give up one of their few areas of political patronage. In his thesis on railway policy making, D. B. Waterson gives repeated examples of where Coates departed from his own principles to reward Reform followers. And deteriorating economic conditions were sometimes used to justify the initiation of railway construction works of secondary importance to absorb the unemployed.³⁷ In retrospect however the most serious objection to Coates’s railway policy is that it continued to overestimate the importance of this mode of transport, it continued to build and operate lines that would never pay, at a time when there was a viable, cheaper alternative—motor transport.†

The need for roading developed rapidly in the twenties. Until then roads had been designed for horse-drawn traffic. With low speeds, sharp corners and severe vertical curves presented no real problem. Grades were generally kept to a reasonable standard, but with no heavy earthmoving machinery heavy cut and fill was avoided where possible and roads tended to follow the natural contours of the country. Ordinary well-bound metalled roads were quite satisfactory, as were single lane bridges. With the advent of the motorcar requirements changed.³⁸ Higher speeds called for wider roads, better surfaces, easier curves, greater sight distances, and two-way bridges; heavy trucks and

*He went so far as to say that “it would be a suicidal policy to follow the system adopted by previous Governments—of starting lines in every little nook and corner all over the country”. (*NZPD*, Vol. 189, 29 Oct, p. 301.) Considering his own Reform Party had controlled the government for over ten years prior to this, Coates’ statement strongly implied a new era was about to begin.

†In 1930 Reform member for Dunedin West, Downie Stewart, maintained that the “drift of the railways was not made manifest until the railways accounts were separated in 1925 from the Consolidated Fund”. (*NZPD*, Vol. 226, 9 October 1930, p. 554.)

buses needed stronger roads and bridges. The old metalled roads required continuous maintenance and where traffic was heaviest no amount of maintenance could keep a metalled road in good condition. Responsibility for most roads rested with the local bodies, although the Public Works Department had charge of the construction of roads to open land for settlement, mining, and other activities, as well as arterial routes through sparsely populated districts. As has been mentioned elsewhere few local bodies could fulfil their roading obligations. They had two basic problems—insufficient technical skill and a shortage of finance. Only Taranaki had been really successful in its road construction: it used tar and bituminous sealing throughout the province. To finance the operations seven toll gates had been erected on the main roads. Revenue from the toll gates far exceeded expectations, but as a long-term method of financing roading throughout New Zealand it was for obvious reasons impractical.

Coates proposed that the Government take over complete responsibility for main roads. In order to avoid the type of political pressures which had influenced the construction of railways, he created a Main Highways Board to proportion and allocate finance for roading generally. The board was to have six members, one from the Public Works Department, two from the local bodies, one representing owners of motor vehicles, and any two others one of whom would be chairman. In practice these last two were always

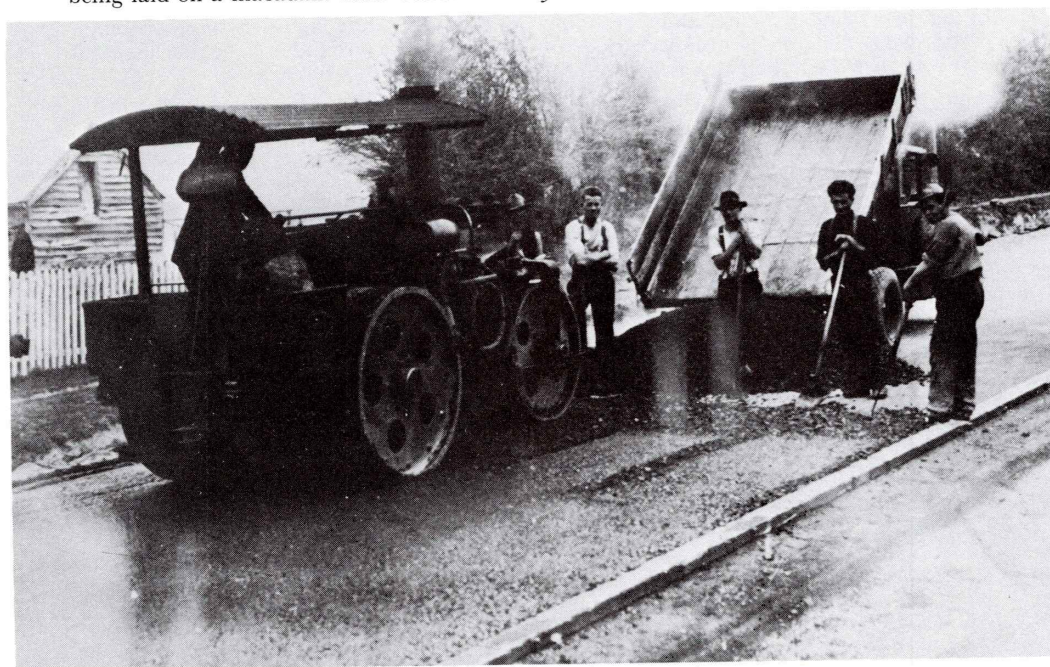


On the Johnsonville-Tawa section of the Wellington-Auckland highway the base course for a bituminous concrete pavement is being laid in half widths. *Turnbull Library.*



Steam rollers, tractor, and trucks engaged on metalling operations on the Taieri County section of the Dunedin-Invercargill highway. *Turnbull Library.*

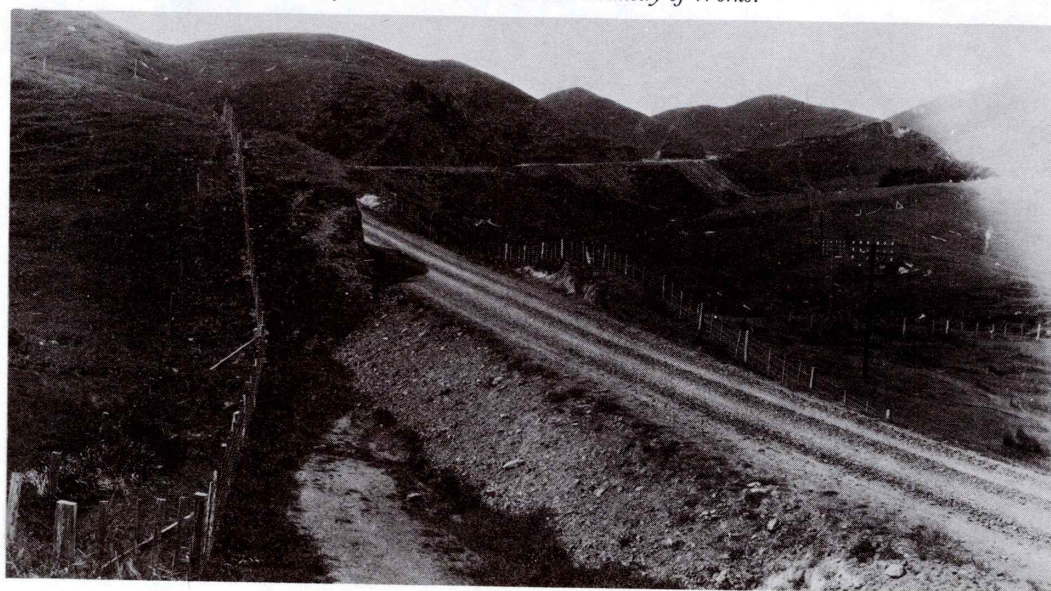
Taieri County section of the Dunedin-Invercargill highway. Bituminous concrete paving being laid on a macadam base. *Turnbull Library.*





To make the best use of scarce supplies of road metal on the Wharerata hill section of the Wairoa Gisborne road sealing was in hand as early as 1924. *Turnbull Library.*

In the early twenties New Zealand's roading was primitive. Here the newly improved main road from Wellington climbs the Paekakariki hill. In the foreground is a piece of the road as it was since the military formed it in the 1840s. *Ministry of Works.*



Public Works Department officers. It was not part of the Public Works Department but with such extensive departmental representation, the relationship between the two was very close. The department acted as the board's engineering consultant and construction agency—a logical arrangement in view of the former's existing Dominion-wide organisation and its experience with local bodies. After innumerable objections to earlier proposals, largely from local authorities, the Main Highways Act was finally passed in 1922 but it was June 1924 before it was in operation. On 9 June that year some 6,000 miles of road were declared main highways. These constituted nearly one-seventh of all formed roads. Of these some 1,046 miles were gazetted Government roads, the cost of which was normally to be met by the board.*

The Board was more receptive than local authorities had been to the Public Works Department's insistence that adequate maintenance was crucial. Annual reports from the Public Works Department had harped on the need for proper maintenance. Even in 1924 the Minister complained that "too often the belief seems to exist in the minds of those responsible that, having laid down a good road, there is no need to do anything more for years to come".³⁹ The policy of the board was to give first priority to maintenance of the existing highway system—its programme included eliminating unmetalled gaps of important routes, for example Auckland to Wellington; extension of sealed surfaces; reconstruction of sections of highway; bridge renewals; elimination of dangerous level crossings; instigation of safety measures generally. The effectiveness of this programme should not be underrated. The second annual report of the board for the year ending 31 March, 1926 gives a table showing the impact that roads upgraded for motor traffic could have on travelling costs and times:

	1925		1926	
	<i>Fare</i>	<i>Time Taken</i>	<i>Fare</i>	<i>Time Taken</i>
Gisborne – Tolaga Bay	£2 (\$4)	10 to 14 hrs	7s. 6d. and 10s. (0.75 and \$1)	2 hours
Gisborne – Tokomaru Bay	£3 (\$6)	11½ to 15½ hrs	£1 (\$2)	3½ hours
Gisborne – Ruatoria	£4 10s. (\$9)	2 days	£1 10s. (\$3)	7 hours
Gisborne – Te Araroa	£6 (\$12)	2 days	£3 10s. (\$7)	1 day

As well as creating a network of modern highways the Public Works Department became involved in regulating the traffic that used them. Local bodies had the authority to enact bylaws for the purpose but in the early twenties they were not effective. A member of Parliament who asked the Government what it intended to do about the situation claimed that "at present no pedestrian is safe, and men, women, and children are being daily killed. The pedestrian does not appear to have any right in the streets, to judge by the manner in which motor-car drivers warn him off and, failing immediate compliance, run him down."⁴⁰ Not only did speed kill, but speed

*All the main highways on the West Coast of the South Island were declared to be Government roads and in the Rotorua district where tourist traffic predominated and settlement was sparse, most of the highways were also declared Government roads.

and weight tore up the existing roads mercilessly.⁴¹ Still the Government preferred not to interfere in an area of local body authority. By 1924 however the situation was serious enough to warrant the Motor Vehicles Act and in 1927 the administration of the Act was handed to the Public Works Department which was instructed to issue uniform regulations for the whole Dominion.*

To cope with the extension of its duties in the field of roading the Public Works Department in 1924 appointed its first highways engineer, A. Tyndall, and sent him off on a trip through Europe and the Americas to study the construction and maintenance of rural highways. Early in the twenties the department had acknowledged the need for its engineers and other technical staff to keep abreast of overseas developments and it became policy to encourage such trips whenever they were practical.

The Highways Board was the first of a number of major statutory bodies with which the Public Works Department was to become closely involved in subsequent years. The Local Bodies Loans Board was one such organisation. The Public Works Department had always had some supervisory responsibilities for government monies expended by local bodies on construction work. But the position had been confused and relations between the Public Works Department and the local authorities were frequently strained. The Local Bodies Loans Board Act 1926 required that the board should obtain expert reports on the projects for which local authorities wished to borrow money. As many of these involved construction most of the work fell on the Public Works Department. It involved a substantial increase of work for the department. Each proposal had to be investigated for engineering and technical soundness and have assessment made of its profitable life. An evaluation of whether the project was in fact necessary was also called for.⁴² Although the Loans Board itself made the final decision, the Act meant that the Public Works Department had considerable control over all public construction whether national or local. In general terms the department's position as the country's largest construction agency was maintained in the twenties and its supervisory powers considerably expanded. However its capacity for long-term planning remained limited.

Railway construction had always been the major item of Public Works expenditure but in the twenties, though it did not decline, expenditure on two other items increased so rapidly that it became clear they would eventually account for the greater proportion of the public works budget. The two were roading and hydro-electric schemes. After a tentative start in the previous two decades hydro-electric development finally reached the point where Coates's desire of "reasonably priced electricity being available for every person in the Dominion"⁴³ could be accepted as a realistic aim. The twenties had begun with just one small government station in the South Island,

*The first traffic inspector in New Zealand was appointed by the Main Highways Board in 1929 to regulate the road between Auckland and Hamilton. At the same time Public Works Department staff officers controlling sections of highway throughout the country were vested with the powers of a traffic inspector. Local authorities however continued to control their own areas. By 1937 it was obvious that even more centralised and uniform control was essential. The Transport Department stepped in and took over all traffic regulation except in municipalities with a population in excess of 6,000. So another episode in the Public Works Department's history ended.

by the end of the decade there were a further four stations operating in the North Island and work was under way for a second major station in the South Island. The role of the Public Works Department in this development was summarised in the 1927 annual statement. Two areas were defined as Public Works Department territory: first the supply of power in bulk to power boards and other local authorities to enable them to carry out retail distribution to the actual customers; and secondly the supervision and control of all supply authorities whether purchasing power from the department in bulk or not.⁴⁴ The Public Works Department was responsible for the investigation and selection of suitable sites for water-power development; for detailed design and ultimate construction (either directly or by contract) of hydro-electric installations and for the design and construction of high-tension transmission lines, as well as the main substations from which local supply authorities drew their bulk power requirements. It also took a leading part in framing supply and wiring regulations, in the registration of electrical wiremen and electrical inspectors, and in the establishment of power boards to act as local distributing authorities. A chief electrical engineer had been appointed in 1911, by 1920 activities had so expanded that a separate hydro-electric section was formed with engineer L. Birks in charge. Eventually a new government department would be necessary to handle the work but in the meantime it remained one of the most rapidly expanding of the Public Works Department's branches.*

Irrigation was another of the department's expanding activities. In 1920 only 3,200 acres were under irrigation, by the end of the 1929-30 season the area had increased to 41,900 acres. The schemes were all concentrated in Central Otago and not only did the Public Works Department design



The Chatto Creek siphon serves to take water from the main race on the western side of the Manuherikia valley to irrigate land on the eastern side. *National Publicity Studios.*

*A hydro-electrical engineer, F. T. M. Kissel, was one of the first to benefit from the department's policy of sending staff overseas. In 1923 he visited the main hydro-electric projects in California, Canada, Norway, Sweden, France, Switzerland, and Italy, and the factories of England and America. Then in 1927 the engineer-in-chief, F. W. Furkert, visited power stations and electrified railways in Switzerland, Sweden, and Italy. His trip to Italy included a visit to the geothermal plant at Lardarello.

and construct them, but it retained control of them on completion. Figures showing farming potential of land before and after irrigation were sometimes staggering. One man on a little over 300 acres was grazing 100 sheep and fattening 80. With irrigation he grazed 600 and fattened 400.* Such cases were by no means exceptional.

The architects also found themselves busier than ever. Where earlier private firms had been employed by hospital boards, school boards, and other educational authorities to design and erect their buildings, much of this work was in the twenties handed over to the Public Works Department.⁴⁵ As the architectural section's work expanded so did criticism of it. Partly it came from other architects who felt threatened by it—but this is not to dismiss it as groundless. An article prepared by a member of the executive of the New Zealand Institute of Architects claimed that Public Works architecture was monotonously uniform and stereotyped.⁴⁶ This type of criticism was to recur in the late fifties and sixties.

The twenties was a period of rapid expansion for the department and this undoubtedly accounts for the fact that it relinquished its monopoly on major public project construction with few objections. Between 1891 and 1919 contracts had continued to be let, particularly for the construction of public buildings. But on the whole the size of the contracts was small, with major projects being either divided into smaller sections and these then let, or, where this was impracticable, the work being done directly by the department. In his first statement to Parliament as Minister of Public Works in 1920, Coates announced that he intended to encourage the straightout contract system. However 2 years as Minister of Public Works somewhat dampened his enthusiasm for private contractors. In 1922 he reminded critics of the Public Works Department and the co-operative system that the history of big constructional contracts in New Zealand had not been a "satisfactory" one—a mild way of describing the past failures—and he insisted that before letting a big contract, the Government would have to be "thoroughly satisfied that to do so will be in the best interests of the country".⁴⁷

A year later Coates announced the Government's intention of calling tenders for a major railway project—some 18 miles of the Tauranga westwards line.† He gave two reasons for the decision. First that it was desirable that a constructional department such as the Public Works Department should have the opportunity of comparing its own methods and costs with similar operations and thereby vindicating them. Secondly he maintained that the letting of a contract to a big construction firm obviated the need for the Government to purchase extra equipment which could not be used continuously once the original project was completed.⁴⁸

When speaking about the Tauranga railway contract, Coates was at pains to emphasise that both the administrative and engineering sections of the

*Another man who previously sold no fat sheep and 4 bales of wool, subsequently produced 980 fat sheep and 15 bales of wool. (*AJHR*, 1922, D-1 p. xx).

†The contract covered the Aongatete, Apata, and Te Puna sections, a total length of 18 miles 18 chains. (*AJHR*, 1923, Vol. I D-1, p. ii.)

department had recommended the course of action he was taking. The department was happy, he said, to have the chance to "demonstrate whether or not there was anything in the constant cry that our methods are both expensive and out of date".⁴⁹ In March 1924 a contract for the work was let to Sir W. G. Armstrong, Whitworth & Co. Ltd. (a British firm).*

A short time later tenders were called for the construction of the Arapuni power complex on the Waikato River. W. G. Armstrong, Whitworth & Co. Ltd., was again awarded the contract. Right from the start the firm seemed to have difficulties with this project. Certainly by present standards knowledge of the site was meagre, but it is also true that Armstrong-Whitworth simply lacked the experience to cope with the eccentricities of the New Zealand landscape. Public Works Department engineers seemed to feel that the firm was reluctant to learn from them. Initially Armstrong-Whitworth had trouble blocking the Arapuni Gorge but eventually the resident Public Works Department engineer on the project took them to Horahora to see how it was done.⁵⁰ By November 1927 the company had completed the dam but had made little progress with the powerhouse. According to the company the area designated by the Public Works Department for the powerhouse was completely unsuitable. The problem was how to dry out the site. Some Public Works Department engineers argued that the company itself had partly created the problems by tipping the rubble from the site excavation into the river directly opposite.⁵¹ Once again the country's experience with a private contractor had been far from satisfactory. The Government agreed that the Public Works Department should take over and complete the project. The 1929 annual statement announced:

"It is a source of satisfaction to the Government that its officers have been able to demonstrate that the claim made by the contractors that it was impossible to erect a power-house on its present site had no foundation in fact."⁵²

However new crises at Arapuni in the early thirties were to overshadow the department's successes.

Despite the economic instability of the decade, under the energetic and innovative policies of J. G. Coates† and the firm, progressive leadership of F. W. Furkert, the Public Works Department expanded more rapidly during the twenties than it had at any time since its inception. But as unemployment grew the department experienced problems that in the thirties threatened to overwhelm it.

Coates had aimed to build up a permanent, experienced group of workmen who would provide labour for New Zealand's public works. By improving living and working conditions he had almost succeeded. But any deterioration in the economy jeopardised these conditions. As early as June 1925 a deputation of public works employees complained to Coates that at least one project

*A minor controversy on the letting of the contract developed over the Government's decision to call tenders world-wide. Some questioned the loyalty of allowing tenderers from outside the "Empire". Coates reassured such critics that New Zealand's preferential tariff system would effectively cut out any "foreign" concerns. (*Ibid.*)

†J. G. Coates is remembered with affection by Public Works staff who worked under him during the twenties. He regularly visited project sites and always produced a bottle of whisky for the local staff after the inspection.

engineer had compelled workmen to sign a document accepting conditions which violated the agreement with the Workers Union.⁵³ Furkert claimed that "engineers would sooner give men jobs under bad conditions than see them unemployed".⁵⁴ But it was a comment from Coates that alarmed the union most. He said he had "known public works for twenty years. Men went on them as stepping stones, and he did not want to keep them there."⁵⁵ Here was a clear indication that the Minister was reverting to the old concept of public works employment as a temporary measure and not a permanent job. This was in direct contrast to a statement he had made 2 years earlier referring to "those men who have stood by the Department for years in its pioneering and have done excellent work often under most adverse conditions."⁵⁶ A new Minister in 1927 rejected the idea that public works should be "the dumping-ground for the unemployed."⁵⁷ But like his predecessors when faced with rising unemployment he could think of no other solution.

Having to absorb hundreds of unemployed not only threatened the working and living standards of regular employees, it also undermined the system of national priorities established by Coates. Labour content became an increasingly important criteria for deciding which works should proceed. As supervisory duties increased, so did the strain on the permanent officers of the department. The 1927 annual statement claimed that many officers had reached breaking point and that unless the number of employees and relief workers was drastically reduced there would have to be a considerable increase of permanent staff.⁵⁸ Right through the decade Furkert had fought for improved salaries for his engineers. But just as he seemed to have won the collapsing economy robbed him of victory. The failure left Furkert in an awkward position because his own salary had been augmented by £500 (\$1,000) in anticipation of a proportional rise throughout the department.*

That public works had not ceased before the end of the decade was due to the policy of heavy overseas borrowing. This in itself seriously aggravated New Zealand's economic position in the early thirties. It also meant that when the collapse of the public works policy finally occurred the effect on the department was shattering. Any restraints or frustrations that irked the department during the twenties were insignificant when compared to events between 1930 and 1935.

*In 1924 Furkert's total salary as head of department and marine engineer was £1,500 (\$3,000). In 1928 this rose to £2,000 (\$4,000). The assistant engineer-in-chief remained on £800 (\$1,600) and a resident engineer on £590 (\$1,180).

REFERENCES CHAPTER 5

- ¹ Waterson, p. 8.
- ² N.Z. Soc. Civ. Eng. Proceedings 1920-1921, Vol. VII, p. 19.
- ³ Letter in the possession of B. Furkert, Karori, Wellington.
- ⁴ M.O.W., Tape 2, Side 1, Track 1, Count 1340, A. G. Harris.
- ⁵ *Ibid.*
- ⁶ N.Z. Soc. Civ. Eng. Proceedings 1920-1921, Vol. VII, p. 23.
- ⁷ N.A. W4 Circ. Memo. 27 July 1920.

- 8 N.A. W4 Circ. Mema. 11 & 23 February 1920 and W1 14/100.
- 9 M.O.W., Dunedin, 39/1.
- 10 *Maoriland Worker* 12 May 1920, p. 4, quoted in Herbert, C. M. "The Changing Pattern of Public Works Settlements in New Zealand 1919-1949", Univ. of N.Z. Auck. College unpubl. M.A. Thesis, p. 24.
- 11 Waterson, p. 136.
- 12 *NZPD*, Vol. 208, 15 September 1925, p. 317.
- 13 *AJHR*, 1922, Vol. I, D-1, p. ii.
- 14 Hasman, C. "The Development of Hydro-Electric Resources on the Waikato River 1900-1964" Univ. of Auckland, unpubl. M.A. thesis, 1965, p. 18.
- 15 Waterson, p. 134.
- 16 N.A. W4 24/1920, p. 6.
- 17 *Ibid*, p. 5.
- 18 *Ibid*.
- 19 *Ibid*.
- 20 *Ibid*, p. 2.
- 21 *Ibid*, p. 3.
- 22 *Ibid*, p. 6.
- 23 *Ibid*, p. 4.
- 24 *Ibid*, p. 5.
- 25 *Ibid*, p. 6.
- 26 *Ibid*.
- 27 *Ibid*.
- 28 See for example *AJHR*, Vol. I, 1923, D-1, p. ii.
- 29 Chapman, R. M. and Malone, E. P., *New Zealand in the Twenties*, Auck. 1969, p. 8.
- 30 For further details on union reaction see Herbert, pp. 38-40.
- 31 Hasman, p. 27.
- 32 *AJHR*, 1920, Vol. I, D-1, p. i.
- 33 Herbert, p. 40.
- 34 *AJHR*, 1924, Vol. II, D-1, p. i.
- 35 Quoted in *NZPD*, Vol. 189, 29 October 1920, p. 300.
- 36 *Ibid*, p. 302.
- 37 *AJHR*, 1922, Vol. I, D-1, p. i.
- 38 The section on roading is based on a paper "*Events Leading to the Need for a Central Highway Authority*" prepared for the author by C. W. Dassler.
- 39 *AJHR*, 1924, Vol. II, D-1, p. xiii.
- 40 *NZPD*, Vol. 186, 14 July 1920, p. 416.
- 41 *AJHR*, 1924, Vol. II, D-1, p. xiii.
- 42 *Ibid*, 1928, Vol. II, D-1, p. iv.
- 43 *Ibid*, 1925, Vol. I, D-1, p. xxvii.
- 44 *Ibid*, 1927, Vol. II, D-1, p. xvii.
- 45 *Ibid*, 1928, Session I of 23rd Parliament, D-1A, p. 15.
- 46 Quoted in *Ibid*, 1924, Vol. II, D-1, p. xx.
- 47 *AJHR*, 1922, Vol. I, D-1, p. ii.
- 48 *Ibid*, 1923, Vol. I, D-1, p. ii.
- 49 *NZH*, 30 July 1923.
- 50 M.O.W., Tape 1, Side 1, Track 2, W. L. Bell.
- 51 *Ibid*.
- 52 *AJHR*, 1929, Vol. II, D-1, p. iv.
- 53 Herbert, p. 41.
- 54 *Ibid*.
- 55 *Ibid*, p. 42.
- 56 *AJHR*, 1923, Vol. I, D-1, p. ii.
- 57 *Ibid*, 1927, Vol. II, D-1, p. ii.
- 58 *Ibid*, p. xxix.

CHAPTER 6 / *The Nadir*

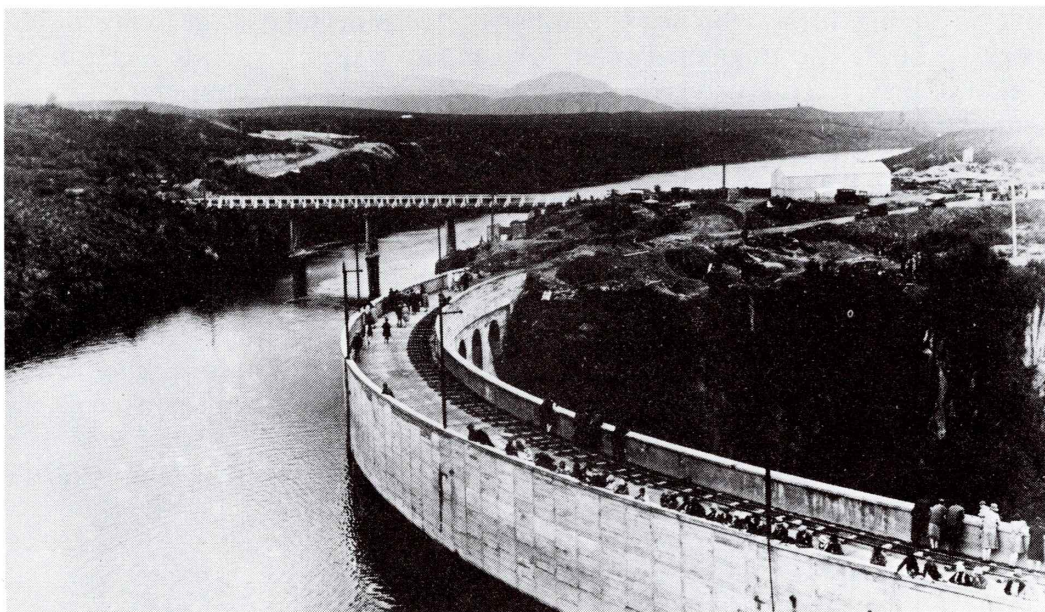
"The Public Works Department still employs, and may continue to employ, more than 8,000 men; but it has passed the peak of its activity and of its importance in the economic life of the country."

(*Otago Daily Times* 1 Oct. 1932 p. 9 quoting the National Expenditure Commission)

By the 1920s the Public Works Department had become an organisation widely respected for its technical expertise. During the early thirties this changed. Novelist John Mulgan, describing New Zealand during those years, wrote that it had always been a lucky country where "everybody was your friend in a hard, casual way" but "it was strange to see how things changed now that the luck had turned, how people grew uneasy and careful with each other, and kept to themselves, watching and saving what they had".¹ It was noticeable that as economic conditions worsened, criticism against the department mounted.* It came from trade unionists who claimed that the department had allowed the co-operative contract system to degenerate into "a ruthless method of sweating the men".² It came from members of Parliament who thought the Public Works Department to blame for the lack of public works in their electorates.³ It came from local bodies protesting at "the high standard set by the Public Works Department in regard to the construction of certain roads".⁴ It came above all from those who represented private contractors and their interests. The department was described as "the most extravagant, the most wasteful, the most inefficient department in the whole of New Zealand".⁵ Its engineers were "mere guessers and gamblers".⁶ All these attacks had one common basis—the declining prosperity of the attackers who found in the apparently flourishing Public Works Department a scapegoat for their own situation. By blaming the department for the growing impoverishment of its workers, the fall-off in public construction, the lack of work for contractors, the wider implications of the economic situation could be avoided.

Of course each outburst of criticism was sparked by some specific incident. The shutdown of the Arapuni hydro-electric station offered ample opportunity for denunciations and recrimination. Department engineers were accused of deliberately misleading the country about the hydro schemes for their own ends: "The country has had no chance. Its money has been spent on these wild-cat schemes without any proper basis of geological or engineering knowledge."⁷ Engineer-in-Chief F. W. Furkert was openly attacked in

*Of course there was always someone with a good word for some aspect of the department. In 1930 the Member of Parliament for Christchurch East noted that there was one thing in the statement before the House which deserved congratulations—the picture spread illustrating it. (*NZPD*, Vol. 226, 9 October 1930, p. 540.)



The Arapuni dam across a gorge of the Waikato River, with an old river channel on the left. This serves as a head race for the power scheme. *Darby. Turnbull Library.*

Parliament and his technical ability questioned—a rare fate for any public servant. Two members of Parliament actually called for his suspension.* But the problems at Arapuni only provided the occasion to voice disapproval of the department, they were not the real cause of it. Movement had occurred in the block of country between an ancient bed of the Waikato River which now formed the headrace and the modern gorge where the powerhouse is situated. Furkert had hired a Wellington aero-club plane to fly him to the site only minutes after hearing from the local engineers that something was wrong.⁸ The engineer-in-chief's report on the situation and his recommendations were largely endorsed by the Swedish expert Professor Hornell whom the Government brought over to review Arapuni and the other hydro projects under way.† But Hornell's reassurances did not silence the department's critics. The Associated Chambers of Commerce wanted the function of the Public Works Department completely changed and all public works submitted to public tender and carried out by private contractors. Referring to past failures by contractors, this far from disinterested body dismissed the "few unfortunate instances" which it said could not "destroy the case for private enterprise, which has proved more competent and more economic the world over than all the splendidly extravagant schemes of money juggling a State could devise"⁹. In New Zealand in the early thirties this was simply untrue—but from the depression there did emerge a number

*One claimed that "In no other place that I ever heard of would the engineers responsible for such a disaster as that at Arapuni be allowed to carry on. I am satisfied that the Government should have suspended the Public Works engineer . . ." (*NZPD*, Vol. 226, 9 October 1930, p. 532.) Another said he had "lost faith in the engineer-in-chief for some time past. I think that he was responsible for leading the Reform Government into many of the errors that it made, and I say to the party in power, 'Be careful and take some steps to correct your position'; because there was something very wrong either with the administration of the Reform Government or with its engineer-in-chief." (*Ibid*, p. 536.)

†One Member of Parliament's comments on the New Zealander's love of the overseas experts is as applicable now as it was then:

"I know that there is a desire expressed—in fact, a demand—by the man in the street that we should obtain expert advice. Why, we hear it all over the place. We even hear honourable gentlemen in this House saying that the failure of Parliament is due to its not being constituted of all business men. Demands for so-called experts come from all classes of society. We seem to get in our minds the impression that there are some supermen somewhere else—outside New Zealand—who can be called over here, glance at our conditions, and give us an opinion,

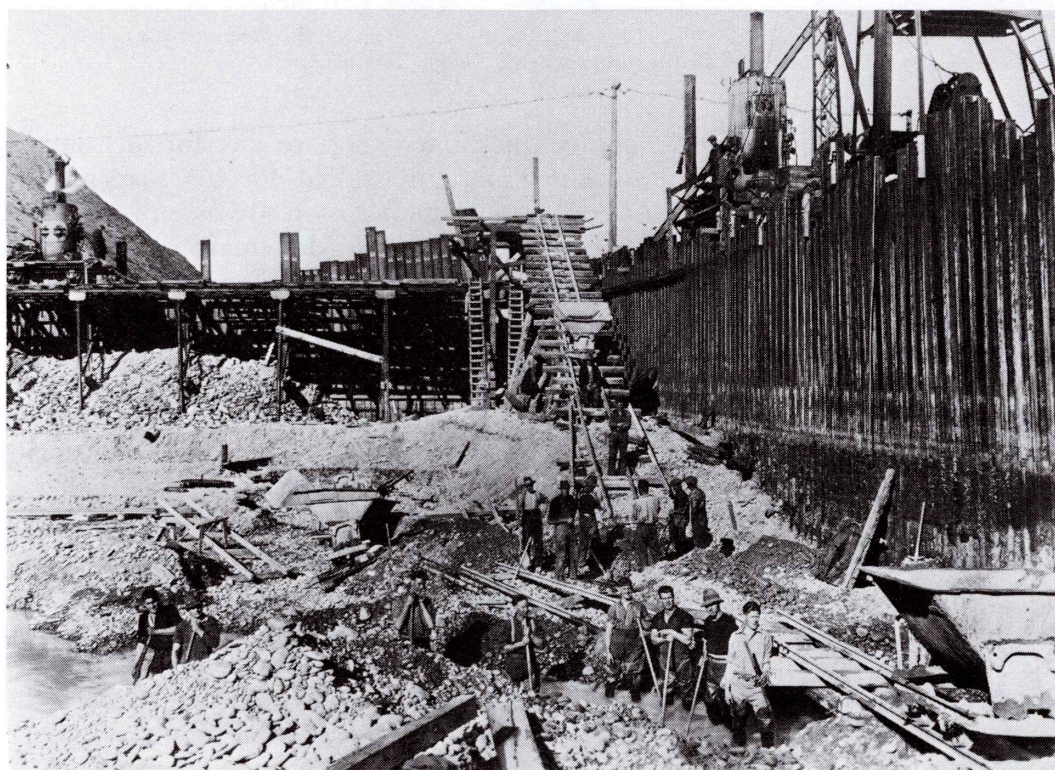
Continued on p. 122.

Continued from p. 121.

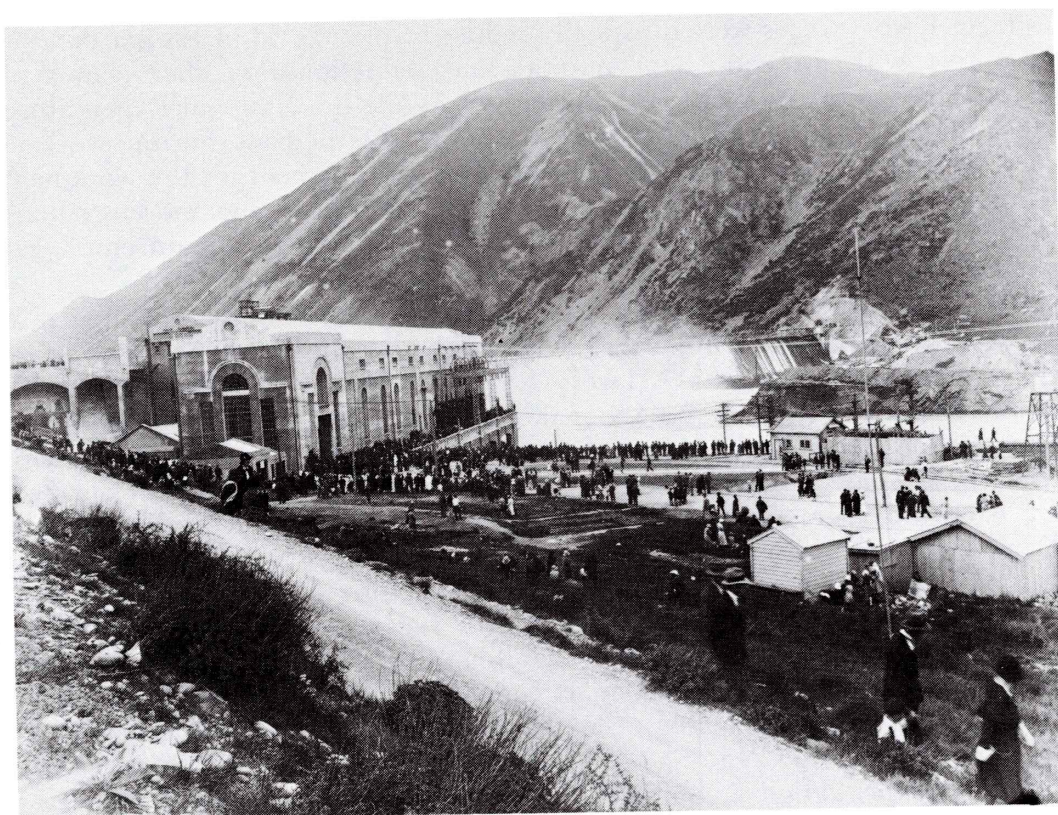
and that their opinion must be right, because of their prestige and their wonderful ability.”
(*NZPD*, Vol. 226, 9 October 1930, p. 547.)

of contracting firms who were competent to undertake large scale public works projects for the department. Apart from its exaggerated claims on behalf of private enterprise, the Associated Chambers of Commerce did raise some interesting queries about the control of a technical department by a non-technical Minister:

“... public works have been undertaken without proper investigation as to their economic soundness. How could it be otherwise when one thinks for a moment of the procedure followed? First, the Minister of Public Works decides that a certain work is desirable. Secondly, the Public Works Department is called on to give an estimate—not, be it noted, to report authoritatively as to whether the project is good or bad business and should or should not be proceeded with. Third, the Minister, who is not an engineer, accepts the estimate without question and brings it before the House. Fourth, the House, also without technical knowledge to be able to challenge the accuracy of the estimate, passes it in turn without question, . . .”¹⁰



Waitaki power development. Excavating shingle from the cofferdam on the Canterbury side of the river. Water and shingle marks show on the sheet piling on right. 1930. *J. H. Christie, Turnbull Library.*



A gala day at Waitaki power station. Water topping the dam is seen beyond the powerhouse.
About 1936. *Turnbull Library*.

It claimed that because the department was responsible to “masters who are not competent to judge its works” it became the real master. Its timing rather than its content made nonsense of the Chamber of Commerce statement. Only a month earlier on 7 March 1932, J. G. Coates, once again Minister of Public Works, had announced a 75 percent reduction in the Public Works Department budget. He had warned of a drastic cut 6 months earlier¹¹ but this had hardly given the department time to prepare for it.

In 1931 the department had had £5,542,000 to spend—in 1932 there was £1,234,000. All public works undertakings were to be put on a purely relief basis.¹² The issue was hardly who would carry out public construction but rather would there be any to carry out. By the end of 1931 very little remained of the department’s usual activities. All railway construction had stopped in October with the exception of two almost completed lines—one from Stratford to Okahakura on the Taranaki–Main Trunk–Auckland link; the other the Tawa deviation out of Wellington. Of the power development projects construction work continued only at Waitaki. The irrigation schemes in Central Otago also survived.* But while some “standard” works remained,

*The department serviced as well as constructed the irrigation schemes and by 1932 it was finding it almost impossible to collect rates for use of the water. Defaulters owed £22,504 by 1932 despite a remission of 30 percent on rates due in 1931—actually only £13 of what was owing at the time of the remission was paid. (*AJHR*, 1932, D-1, p. ix.)

as from 1 June wages were drastically reduced from 12s 6d to 10s per day for labourers with an equivalent proportional reduction for other classes of workmen and for co-operative contractors.* While the National Expenditure Act imposed cuts on staff members of from 5 to 12½ percent, putting workers on a “relief” basis meant a general reduction of 20 percent for the workmen. Permanent staff became little more than relief administrators and custodians of the unemployed. That is if they were lucky enough to remain employed themselves.

The cuts had begun in 1930 when Premier G. W. Forbes announced a 10 percent reduction in the wages of all public servants.¹³ It operated from the beginning of April 1931. Hardly a year later the Public Works Department budget was slashed and about the same time the National Expenditure Commission recommendations became effective. In July another report from the commission set out in minute detail economies that had to be effected by each Government department. Its implications for the Public Works Department were drastic:

“We are definitely of the opinion that the time has arrived for a halt to be called in public-works expenditure. We consider that a return to the contract system of carrying out public works is of prime importance, and that the Public Works Department should be reduced to a staff of Advising and Inspecting Engineers, as was intended when the Department was first inaugurated.”¹⁴

This recommendation amounted to no less than the dismemberment of the department as a construction agency. The commission emphatically dismissed any alternative:

“We feel so confident that a reversion to the contract system is the only satisfactory basis upon which true economy can be obtained that we have not considered it necessary to inquire into the possibilities of effecting economy, assuming the present policy is to be continued.”¹⁵

Because of this attitude there was no detailed examination of the Public Works Department’s administration and therefore no specific criticisms of its operations.† The commission did claim that a reduction in the department’s size was long overdue and that the financial position of the country was “in no small measure the result of extravagant expenditure out of loan money on schemes which, from a national point of view, have not justified the expenditure which has been incurred on them”.¹⁶ This was a comment on government policy rather than the way it was carried out, although a little later there was implied criticism in the statement that “large works are frequently authorised on the basis of estimates compiled by engineers, but in many cases the actual cost greatly exceeds the original estimate”.¹⁷ To solve this particular problem the commission recommended reversion to the contract system and the establishment of a board of businessmen to review all

*On ordinary relief works wages of married men were 10s and for single men 8s per day. (P.W. Circular 0/1/102 of 20 May 1932.)

†There was one exception to this. The commission commented that “the Public Works Statement appears to be rather extravagantly prepared and too profusely illustrated. The cost of printing in 1931 was £264, which appears to be excessive, and we recommend that further economy be practised in this connection”. (*AJHR*, 1932, Vol. I, B-4A, p. 154.)

public works projects before they proceeded. The National Expenditure Commission acknowledged that it had in mind much the same type of review board envisaged in section 91 of the Immigration and Public Works Act 1870.¹⁸

Groups of businessmen intent on reforming the Public Service, be they committees, commissioners, or Associated Chambers of Commerce, seem always to operate from one basic assumption, which they hold to be self-evident and unquestionable: that the injection into the service of administrators with business ideals is essential. The National Commission on Expenditure was no exception. It urged that "when administrative positions in the Public Service require to be filled, particularly in those departments having technical, professional, or scientific interests, the officer appointed should be selected chiefly because of his administrative abilities, and should be able properly to balance and co-ordinate the various policy and financial matters affecting the department".¹⁹ It was certain that "technical and professional men as a rule, do not make the best administrators", and that "an absence of bias" was far more likely to be found in a non-professional administrator when called on to balance non-technical against technical considerations or to co-ordinate technical and non-technical points of view.²⁰ For Furkert the commission's recommendations were another blow to his efforts to maintain the organisation he had so energetically built up. To his friends and family he let it be known that he could not face dismembering the department. Having to detachedly decide which of his officers should stay and which would have to go was more than he could handle.* Something of this came over in his final report to the Minister before his enforced retirement:

"It has been a hard year, and the necessity for selecting for dismissal hundreds of officers, many of whom I have been associated with almost for life, has been very distasteful. In making the reductions efficiency has been the first consideration, but, amongst others, such questions as family responsibilities, eligibility for superannuation or otherwise, have been given due weight."²¹

To add to the unpleasantness of his position he was almost constantly under personal attack. In the Legislative Council in 1932 a speaker blamed him personally for the condition of the work camps. The Hon. C. J. Carrington was quoted as saying that it was hard to speak too strongly of the stupidity of the Public Works Department. He singled out Furkert as primarily responsible for the department's alleged inadequacies:

"It has become evident to many competent observers that the department has become top-heavy, and it is suffering from what might be called departmental blight, and that a great saving could be effected if some of the senior officers were retired, . . . There are many young engineers whose efforts are

*In fact Furkert had to organise a staff reduction of nearly 40 percent and was then faced with a request for further re-organisation. (*AJHR*, 1932, Vol. II, D-1, p. ii.)

stultified through the fact that everything has to go through the under-secretary, who, by the aid of an electric button and a rubber stamp, can control the department.”²²

Furkert ceased duty in October 1932 about 18 months before his retirement was due.

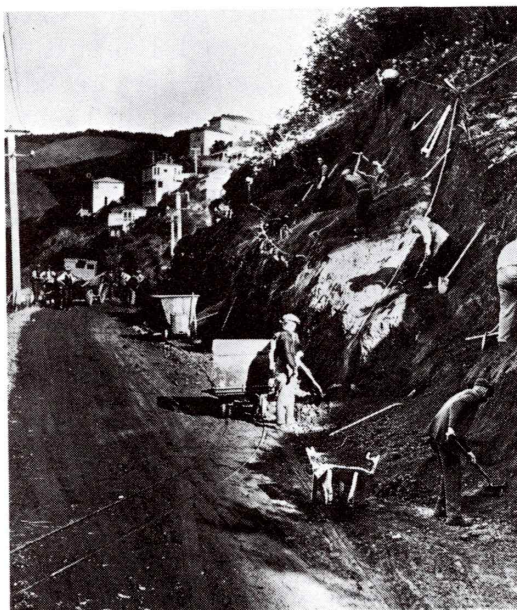
The Coalition Government, so single-minded in its economising in other areas, failed to fully implement the recommendations of its commission in regard to the Public Works Department. It could hardly use private contractors when there were no public works to let by tender. By the middle of 1932 the department’s activities consisted almost entirely of improving back-country roads, bush felling, scrub cutting, stumping and logging, marram grass planting, hawthorn hedge cutting, clearing boulders from farms, levelling agricultural land, clearing noxious weeds, fencing, tree planting, clearing river beds, and building stop banks.²³ Its sole *raison d’être* was as a relief agency—hardly a task to be undertaken by private contractors. Ironically its usefulness as a relief agency was the most important factor in the department’s survival until economic conditions once again allowed it a constructive role. Furkert had recognised that the department had to make itself indispensable if it was not to disappear in the Government’s search for ways to economise. This accounts for his willingness to accept unemployment relief as a legitimate Public Works Department activity. In the twenties the unemployed had been a burden which caused an inefficient deployment of staff for supervisory duties, an unnecessary dispersal of activities, and a curtailing of expenditure on modern machinery. In the thirties the need to provide the unemployed with work saved many public works officers from joining their ranks.

An Unemployment Board had been set up in 1930 to inaugurate relief work schemes and it did this by subsidising private employers, local bodies, and farmers. The Public Works Department continued as it had done in the twenties to provide some jobs on its ordinary projects. In August 1931 however the Unemployment Board instigated a system of relief camps for single men to be organised and staffed by the Public Works Department but largely subsidised from the board’s funds. In a confidential memorandum to his district engineers Furkert outlined how the scheme would work. An initial experiment was to be carried out with 1,000 men on roadworks. The Main Highways Board would find the cost of supervision, tents, internal transport, tools, and food, the Unemployment Board would supply about 10s. a week “pocket money” for each man.²⁴ The 10s. was not an assured sum, the men were to be paid on a piece work basis—and here the Public Works Department’s experience with fixing co-operative rates was to be invaluable—“to enable the average man, working with reasonable diligence, to earn 10s. [\$1] a week.” In its generosity the Unemployment Board agreed that effort



ABOVE: Pack-horses setting out from the head of navigation for construction camps on the Waikaremoana Galatea road. 1930s. *Turnbull Library.*

RIGHT: Unemployed relief workers widening a road during the depression. *Turnbull Library.*



should be rewarded and vice versa, but hoped that no man would get less than 5s. a week. The engineer-in-chief urged his officers to keep expenditure down to an absolute minimum. They were not to lose sight of "the basic fact that the fund is very pinched for money, and if anything in the nature of luxury or even comfort is permitted to establish itself, the scheme will break down, and there will be no work at all."

Apparently most of them did lose sight of that very fact. On 12 September Furkert wrote that "the information that has come to Head Office up until now indicates that the majority of the District Engineers have failed to grasp the true inwardness of the situation regarding unemployment".²⁵ He repeated that there was only £1 10s. (\$3) per man per week to set up the camps, provide for supervision and incidentals, feed the men and pay them. At this point the letter became desperate:

"If a strenuous effort, and a successful effort, is not made by District Engineers to keep the expenditure down then the experiment now being made will be considered a failure, and the Department will lose the work, and it must be apparent to any thinking officer that unless the Department justifies its existence and gets control of all the work it possibly can, there will be severe retrenchment. Our only hope of holding the Department's organisation together is to carry out what the necessities of the case demands, what the Government wants and what you have been asked to do. The amount of money which has been spent on preparing the camps in some cases is quite uncalled for. Remember the old adage that the successful engineer is the one who does for one dollar what any fool can do for two."

His final paragraph contained a warning and a scarcely veiled threat:

"I cannot too strongly emphasise the necessity of every officer looking after his own interests, because failing this he cannot expect anyone else to do for [*sic*] him, and it will only be by strenuous efforts that it will be possible to avoid drastic retrenchment. On the other hand, if the P.W.D. gets the work of employing those being relieved by the funds of the Unemployment Board all will be well with individual officers."

The staff's position had been accurately summarised by a member of Parliament a year earlier:

"When travelling in the country, I found that in nearly every case the sympathy of the head of the Department and the engineers in charge of the different districts, when a question of expenditure arose, was with the settlers, but that, while they endeavoured to help them, they realised all the time their responsibility to the State for the expenditure of the money; and they always gave their decisions and advice with the greatest care, recognising that they were paid by the State and were therefore responsible to it."²⁶

After initial difficulties with the camps, Public Works staff soon became experts at paring every expense and practising absolute economy. That they

met the Government's requirements is evident from the fact that the camp system passed from the experimental to the permanent stage and was extended from single to married men. It became a mainstay of the relief system and generated more discontent during the depression than any other relief scheme.²⁷

When the scheme was extended to married men at the beginning of 1932 bitterness was rife and vocal. The Public Works Department was not responsible for the standard rates which were set by the Unemployment Board,* but it was responsible for the fact that on piecework these rates were seldom reached. Returns for March, April, and May 1932 showed that single men averaged under 10s. a week. The department acknowledged "that on the whole piecework rates are a little low".²⁸ And in its eagerness to survive, to keep within the limits set, the department undoubtedly acquiesced in some appalling camp conditions. There were complaints of inadequate rations, badly cooked food, tents that leaked, lack of proper bedding and washing facilities, no provision for drying clothes.²⁹ The Akatarawa relief workers wrote to the *Evening Post* that despite reports to the contrary they were not happy and contented:

"The camp possesses no crockery. Food is served upon tin plates sufficiently rusty to test the most hardened of palates. . . . No bath is provided and the men have to do the best they can with kerosene tins or bathe in the river. With winter approaching this is an important consideration since all the men do not possess tins."³⁰

Lack of washing facilities was a characteristic of most of the camps. In an article otherwise commending a camp at Aka Aka, near Pukekohe, a journalist sarcastically commented:

"The P.W.D. had naturally made no provision for such an affectation as bathing, the presumption apparently being that any who wanted a full-length splash during the currency of the three months' job could either wallow in one of their own ditches or walk the six miles to the nearest accessible bathing pool on the Waikato."³¹

The Public Works Department staff were placed in an unenviable situation. In order to maintain their own positions they had to enforce conditions which nobody should have had to accept.† They were confronted with justifiable bitterness and anger which they were expected to control. Many of them were deeply sympathetic to the plight of the unemployed. Some of the latter even claimed that in order to increase the amount paid when conditions had been difficult, those in charge would sometimes liberalise quantities as an advance in order to improve the payout to the men.³² With good humour and sympathy Public Works Department staff could often defuse a dangerous situation. In one such incident a particularly aggressive inhabitant of a single men's camp in the Napier district decided it was time to let the camp

*Married men were supposed to earn between £1 17s 6d and £2 10s 0d a week depending on the number of children. In 1934 the Society of Friends calculated that a married couple alone would require £1 17s 6d per week, and a couple with three children under 10 a minimum of £2 15s.

†In one respect relief workers under the Public Works Department were better off than others—their employment was continuous and they did not have to stand down every fourth week. (*AJHR*, 1931, Vol. II, D-1, p. iv.)

supervisor, Public Works officer Frank Hermans, know how he felt about the whole set up. He fronted up to him and spat out "You're nothing but a German bastard"—"Look lad you've made a mistake," replied Hermans, "I ain't a German bastard, I'm a Swiss bastard."³³ Often engineers questioned aspects of the camp scheme. The assistant engineer for Palmerston North was forced to complain that the Labour Bureau in Wellington was "sending men who are absolutely unfit to be in camp". Among the illnesses from which men had been suffering he listed a badly ulcerated stomach; bad varicose veins; a septic hand; a paralysed arm; bad body sores; a man just discharged from hospital after a compound fracture of the leg.³⁴ But there was a limit to what any individual could achieve—the basic injustices remained and in the public mind the Public Works Department was lumped with the Government as a perpetrator of many of them. It was to a large extent the antagonisms created by the works camps which made many of the department's permanent staff fear the prospect of a Labour Party government.

Organising and manning relief camps were not the only duties undertaken by Furkert in his efforts to keep the department going. As unemployment increased the pressure on the department from politicians who wanted jobs for their families, friends, or constituents increased. Head office often notified district engineers that a certain person had been recommended by a Member of Parliament or by the Minister and inquired as to suitable openings.³⁵ In one case where there had obviously been pressure, and the request was particularly insistent that the Dunedin district engineer employ two men, the resident engineer at Alexandra was asked to do something about them. After some delay and several telegrams the latter refused to act. "I think that I can claim", he wrote "that our racemen are a good body of employees and that the selection of additional men through political channels is unlikely to improve the standard."³⁶ On another occasion the district engineer was asked to "please note and return P-'s papers and keep him in mind for any vacancy which may arise as the Minister is particularly desirous of P- being placed".³⁷ The pressure was there. Clearly the individual officers could act or not as they chose—at their own risk.

Sometime before 1936 things began to change. By the end of 1933 deferred works were being gradually restarted and new activities undertaken. One field where this was very evident was aerodrome construction. In 1930 the Government had approved a scheme for the establishment of a chain of landing grounds and the department had been requested to undertake the planning and execution of the necessary construction work. By mid-1934 reports had been made on 40 sites and 16 were being surveyed. Construction work was under way at Wigram and a start had been made at Westport and Hokitika. The following year a further 72 grounds were investigated, another 27 surveyed, and construction was actually under way on 30. Clearly if the



One of the first built after the depression, the Government Departmental Buildings in Stout Street, Wellington, was rapidly taken up as headquarters accommodation by the armed services as war developed. *Turnbull Library.*

Coalition Government believed an activity to be essential to the nation it went ahead regardless of economic circumstance. Even while being forced to shed some traditional responsibilities, the Public Works Department was acquiring new ones.* Even at the height of the depression, the future of the department was never as insecure as it had been in the late 1880s.

What proved to be a disaster for the Napier district provided the one period of real achievement for the department in the years 1930–35. The Napier earthquake occurred on 3 February 1931 and the Public Works organisation was a major factor in preventing the situation from becoming worse than it was.³⁸ F. W. Furkert left his eldest son's wedding in Wellington the moment the vicar had pronounced the couple man and wife, changed from morning clothes in a car waiting outside and sped to Napier to take charge of operations himself.³⁹ All the department's resources were at the district's disposal. The earthquake had put Furkert where he liked to be—at the heart of the action. Engineer Alan Harris recalled the thoroughness with which he tackled everything at hand.

*In early 1935 the department demonstrated that despite the problems of the depression it had still retained much technical skill. Instead of importing them at some expense from the United States, the department decided to design a modern grader and advertise a contract for the manufacture of the machines in New Zealand. It was not only cheaper than the imported item but the department introduced several improvements for New Zealand conditions in the design.

“One of my jobs was to find out the intensity of the earthquake by examining what had been displaced, etc. . . . One day I went into temporary headquarters where Furkert was sitting at the lunch table: ‘Oh Harris, you’re the very man I want to see. We had W. L. Newnham and somebody else up from Wellington and while we had lunch we had quite a bad shake. They cleared out and I sat and watched. When the shake was over I noticed a spot of tea had splashed out of one of the cups and landed on the tablecloth an inch and a half from the edge of the saucer, work that one out!’ ”⁴⁰ Another engineer in charge of the work at the time remembered a remarkable act of calm bravery that occurred on the site where the Mohaka viaduct was being built:

“The foundations of Mohaka viaduct were composed mostly of very large holes in the banks of the gorge to take the concrete piers and in the bed of the river large concrete caissons which had to be sunk by compressed air down to depths of up to 70 ft. The caissons which had to go far below water level were solid concrete except for a hole about 3 ft diameter in the middle with a working chamber at the bottom. The lowest part of the whole structure was a steel cutting ring which by the weight of the caisson above was pressed down into the river bed. The shingle or rock was excavated by hand by two men working in the chamber under compressed air. They shovelled the material into a bucket which was hoisted up through the 3 ft hole to the airlock above and as they took dirt out the caisson sunk down and further sections were added at the top. This went on till the correct depth was reached.

This work was going on when the Napier earthquake struck—one of four caissons was being sunk. Two men were down below, with a lock man on top in his normal position. When about 11 o’clock the earthquake struck things were pretty grim for those in the cylinder. The airlock on top of the caisson was supplied with electricity from a steam driven electric generator ashore. This served for electric light and for driving an electric winch. The air for the men working in the cylinder had to be at a pressure sufficient to keep the water out of the working chamber down below and this was supplied by a compressor also driven by the steam engine. Now when the earthquake happened it’s rather interesting to note that the belts from the steam engine to the compressor and to the generator didn’t fly off the pulleys. From this it can be assumed that the waves of the earthquake were at right angles to the direction of the belts—if this hadn’t been so the men would have been lost.

When the cylinder jumped around a considerable amount of compressed air escaped and this allowed the water to rise—to shoulder height—then the compressor took over and the water was pushed out again. But the men below were frantic. There was a lifeline from the lock to the chamber—a rope for use if the winch was not working. There was a fight as to who was to get on to it first. As a result neither did. Fortunately the airlock man kept his head.

Now in the middle of the floor of the airlock there was a round hole through which the winch wire goes to raise or lower buckets of dirt or to bring the men up or down. In the airlock also were spare tools for the work below. While the caisson was jumping around the airlock man had to stop tools jumping about and slipping through the hole on to the men below, so he was kept busy till the earthquake settled down. Then he tried the electric winch and lowered the wire with a stirrup on it—only one man could stand on it and be hauled up. Another fight developed. Eventually one man got on and was brought up. He was beside himself with fear and really frantic and immediately made a dive for the valve which lets down the air pressure to get out. Well, if he'd been allowed to do this he would have killed all three of them. The lockman chose the only course available. He picked up a short length of steel and gave his mate a sharp rap over the head and laid him on the floor, then sent the stirrup down for the second man, who came up calmer than the first bloke. The airlock man then quietly let the pressure down, which took half an hour, then let them all get out. He had saved their lives. His name was Doug Bailey.”⁴¹

In one important area the Napier earthquake resulted in a significant change of emphasis within the department. Where previously public buildings had been the almost exclusive concern of the architects, after the earthquake the role of the engineers in structural design became increasingly important.

As has already been seen however, the achievements at Napier which clearly demonstrated the worth of an organisation like the Public Works Department at a time of a major emergency, were soon forgotten in the desperate search for ways to economise.

REFERENCES CHAPTER 6

- ¹ Mulgan, J. *Man Alone*, Hamilton, 1960, p. 42.
- ² Quoted in Waterson, p. 131, from *New Zealand Worker*, 24 October 1928, p. 4.
- ³ For example *NZPD*, Vol. 226, 9 October 1930, p. 536.
- ⁴ *NZH*, 18 July 1932, p. 11.
- ⁵ *Ibid.*, 24 November 1931, p. 11.
- ⁶ *NZPD*, Vol. 226, 9 October 1930, p. 531.
- ⁷ *Ibid.*, p. 532.
- ⁸ MOW, Tape 1, Side 2, Track 1, Count 935, B. R. Furkert.
- ⁹ *NZH*, 12 April 1932, p. 6.
- ¹⁰ *Ibid.*
- ¹¹ *AJHR*, 1931, Vol. II, D-1, p. i.
- ¹² *NZPD*, Vol. 231, 1 March 1932, pp. 111-114, also *Auckland Star*, 2 March 1932, p. 10.
- ¹³ *AJHR*, 1932, Vol. I, B-4, p. 15.
- ¹⁴ *Ibid.*, B-4A, p. 167, paragraph 1637.
- ¹⁵ *Ibid.*, p. 153, paragraph 1511.
- ¹⁶ *Ibid.*, p. 150, paragraph 1494.
- ¹⁷ *Ibid.*, p. 153, paragraph 1507.
- ¹⁸ *Ibid.*, p. 167, paragraphs 1638 and 1640.
- ¹⁹ *Ibid.*, p. 7, paragraph 28.
- ²⁰ *Ibid.*, p. 6, paragraphs 24 and 27.

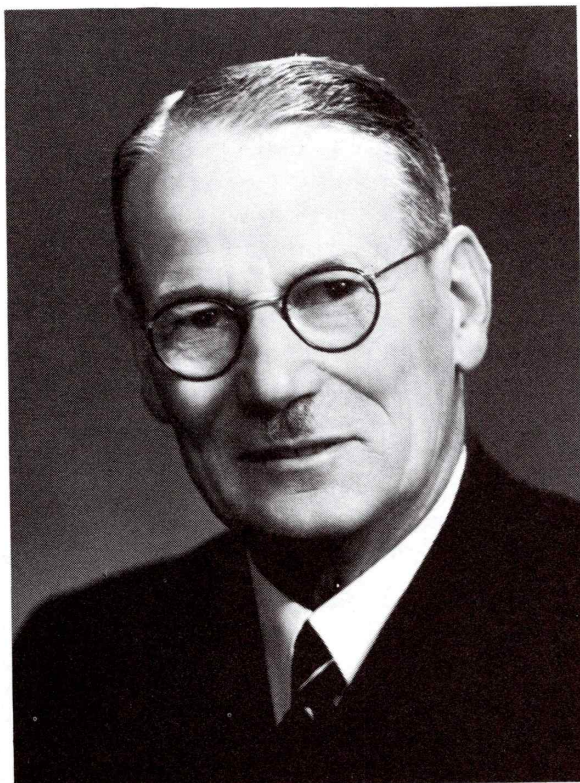
- 21 *Ibid.* Vol. II, D-1, Appendix B, p. 49.
- 22 *NZH*, 12 May 1932, p. 11.
- 23 Herbert, p. 70.
- 24 MOW, Dunedin, file P.W. 6/17/48, 28 August 1931.
- 25 *Ibid.* 12 September 1931.
- 26 *NZPD*, Vol. 226, 9 October 1930, p. 541.
- 27 Noonan, R. J., "The Riots of 1932: A Study of Social Unrest in Auckland, Wellington, and Dunedin", unpubl. M.A. Thesis, A.U. 1969, Chapter 10.
- 28 Public Works Circular No. 0/1/108, 9 August 1932.
- 29 Noonan, p. 24.
- 30 *Evening Post*, 15 April 1932, p. 6.
- 31 *New Zealand Observer*, 10 March 1932, p. 9.
- 32 MOW, Dunedin, file P.W. 6/17/48, 30 November 1931.
- 33 MOW, Tape 1, Side 2, Track 1, D. O. Haskell.
- 34 N.A. L1, 5/4/316, 6 July 1932.
- 35 See for example MOW, Dunedin, P.W. 6/4, 15 August 1930.
- 36 *Ibid.* 29 August 1930.
- 37 *Ibid.* 25 September 1930.
- 38 See *AJHR*, 1931, Vol. II, D-1, p. xxv, for details of what the P.W.D. did.
- 39 MOW, Tape 1, Side 2, Track 1, Count 925, B. R. Furkert.
- 40 *Ibid.* Tape 2, Side 1, Track 1, Count 1360, A. G. Harris.
- 41 *Ibid.* Tape 1, Side 2, Track 1, Count 1285, D. O. Haskell.

CHAPTER 7 / *The First Semple Years*

“Each department is one of the Ships of State and the whole fleet is now under the command of the Labour Government. I am Captain of this Ship of State and you are the crew and we are blazing our way through the jungles with a torch in one hand and an axe in the other.”

Robert Semple in a pep talk to Public Works Department personnel; quoted by L. J. Keys, MOW, tape 4, side 1, track 1.

In 1935 New Zealand elected a Labour Government. The new Minister for Public Works, Robert Semple, claimed that the depression administration had converted the department into an unemployment relief agency.¹ His evaluation was only slightly exaggerated; despite small increases in expendi-



Robert Semple (1873–1955), Minister of Public Works, December 1935 to January 1941, December 1942 to April 1943 and then Minister of Works to December 1949. *Spencer Digby Studio. Turnbull Library.*

ture in 1934 and 1935 the primary purpose of public works had remained the absorption of as many unemployed as practical for the smallest possible expenditure.

Labour believed that public works could be a key factor in the restoration of economic stability. The party's policy was essentially Keynesian: an expanded works programme providing jobs at standard rates of pay besides reducing unemployment would restore the spending power of the community and therefore stimulate the economy. The rationale behind relief work had been that for a minimal expenditure it gave men something to do however meaningless. By accepting the argument that only a drastic increase in Government expenditure could get the economy moving again, the Labour Party rejected the very basis of relief work. Instead it claimed that the unemployment problem could best be solved by allowing the Public Works Department to fulfil its true function. Overnight the Public Works Department reverted to its original role of design and construction agent for the State.

At the end of 1933 Adam Hamilton, then a Minister of the Coalition Government claimed that "New Zealand had been so intensively developed in the last 40 or 50 years that it was difficult to find useful Public Works".² Labour's election commitment to "a more vigorous public works programme"³ denied this view, but the party's policy made no attempt to identify precisely the type of works it felt most appropriate to New Zealand's needs. Staff engineers throughout the country were requested to supply details of possible projects with the one proviso that there would be "no haphazard selection of works" and that cabinet would "call upon the services of experts to examine anything in the nature of a doubtful proposition from an economic point of view".⁴ Head Office was flooded with suggestions. Apparently there were few who shared the Hon. Hamilton's view of an "intensively developed" country.

The department was then instructed to draw up a 3-year programme, selecting works in order of their "importance and urgency".⁵ The criteria used to assess "importance and urgency" were apparently determined by the department itself. The resulting programme emphasised the need for improved communications. Railways, roads, harbours, and aerodromes were included under that heading, with expenditure concentrated on roading. For the 1936-37 financial year communications were to receive two-thirds of the total public works budget.⁶

Economic conditions had forced the Coalition Government to abandon railway construction. The return of prosperity did not really revive it. On the grounds that it was uneconomic to pay interest on money already spent on uncompleted lines that would never return anything, the Labour Government decided to finish a number of them. The Napier-Gisborne railway was a typical case; \$7,118,000 had been spent on it,⁷ but only the part

between Wairoa and Waikokopu was operating. The rest of the track was, in the words of the engineer-in-chief "lying idle and deteriorating".⁸ Yet all that remained to make it fully operational were some repairs on the Napier-Putorino section which had been damaged by the 1931 earthquake, the laying of rails and ballast over about 8 miles of line and the erection of the Mohaka Viaduct*. It did not however prove economic to finish all the uncompleted lines. Work on the Rotorua-Taupo line for example was restarted then stopped. According to Semple "It had no economic background and there was no possible chance of ever paying for axle-grease".⁹ The great era of railway construction had really ended with the twenties. For the department it was never again a major activity.

Apart from communications, land development, erection of public buildings, and development of electric power were the other main areas covered by the 3-year programme. Although proportionately their share of the expenditure was not great, there was a dramatic increase on what had been expended on them in the early thirties.

As Minister, Semple's real interest was not what the public works programme would be, but how it would be carried out. "My effort has been to frame a policy such as I believe will ultimately result in clearly defining the system upon which the Government intends to carry out its public works".¹⁰ He had very definite ideas about the changes that had to be made if the department was to function efficiently. It had to be mechanised and relations with its employees had to be improved. Semple's previous experience of public works had been as a tunneller and a union organiser. It was natural that his sympathies should be with the workmen employed by the department. Engineers and other professional staff had traditionally fulfilled managerial functions and there was some uneasiness about the effect a Labour Government would have on their positions. One engineer, at the time in charge of a project at Milford Sound, recalled that many of his colleagues feared a Labour Government would mean workers' committees controlling jobs.¹¹

Propaganda by Labour's opponents had painted the party far more radical than it really was. Semple aimed to improve rather than change. His political views and his own background did however lead him to emphasise the role of the department's employees in its satisfactory functioning. Whatever minor improvements had occurred in the last 18 months of the Coalition Government they had not affected the position of the workmen. Semple recognised that the discontent pervading most public projects resulted from a relief system that gave the men no inducement to work properly.¹² His first step was therefore to abolish relief work and reclassify all Public Works Department jobs as standard works. This meant an immediate pay rise for all employees. Negotiations were begun with the New Zealand Workers' Union

*The interest charges on the line to 1936 amounted to over \$2,520,000 and the annual interest rate in 1936 was over \$320,000. (*AJHR*, 1936, Vol. II, D 1B, p. 3.)

and the agreement* that resulted in early 1936 introduced a 40-hour, 5-day working week and holiday privileges†. The only completely new feature was the introduction of compulsory unionism on all public works projects. Section 30 provided for the registration of every workman in the employ of the department as a financial member of the NZWU within a month of the first display of the agreement on the works on which he was employed. Every new man arriving on a job had to join within a month unless he was an artisan with membership in a craft union, in which case he was given 2 months to enrol. The agreement provided for the dismissal of anyone who did not comply.¹³

Other sections of the agreement laid down revised standards of accommodation, provided for recreation halls, libraries, cookhouses, and canteens as well as placing on the department the responsibility for supplying cheap fuel where it was not otherwise available.¹⁴ Provisions for the workmen's comfort did not differ radically from those enumerated in the first union agreements made with Coates in the early twenties. Semple however viewed better living and working conditions as a right whereas Coates had treated them as a privilege to be granted when conditions allowed.

Professional staff who had feared a radical reorganisation in labour management were reassured by Semple. He endorsed the co-operative contract system as it had operated for the past 40 years because "it encourages men to give of their best, as they are paid by results and know that they will be paid what they earn".¹⁵ The engineer was to remain firmly in control: "Workmen will be allowed to select their workmates. They will also be allowed to appoint their headman, subject to confirmation by the engineer. This provision is necessary to ensure that the best men available are placed in charge of parties".¹⁶ To Semple adequate wages and working conditions were the right of every employee in return for which he was expected to give a fair return; "I have spoken to the workmen wherever I have gone and impressed upon them the fact that the Government expects them to give a fair day's work for the wages they are receiving".¹⁷ And on the whole they did. Semple's particular blend of carrot and stick and his own infectious enthusiasm rapidly transformed a demoralised unskilled disparate group into a highly efficient construction force.

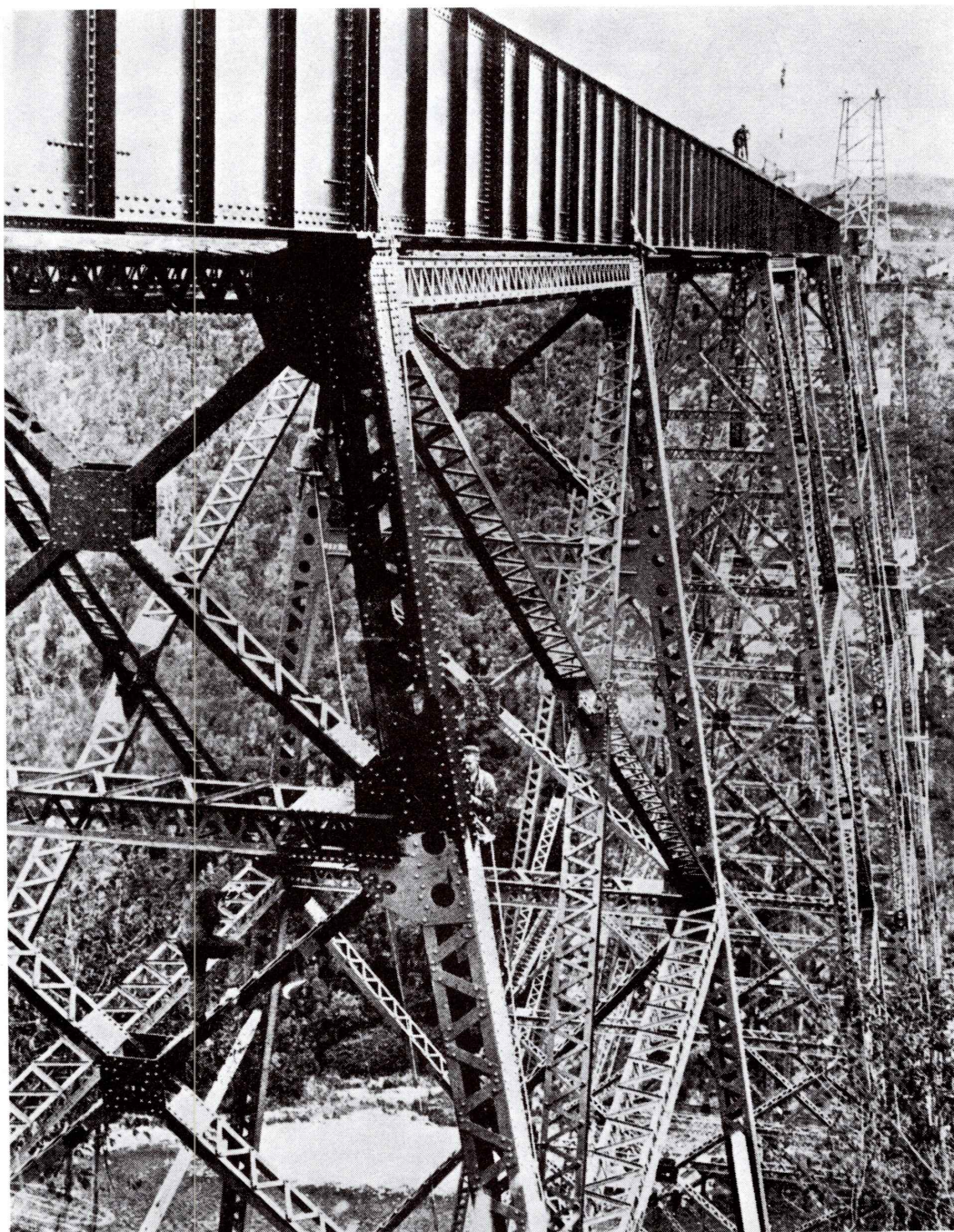
The completion of the Mohaka Viaduct was an example of Semple's methods at work. The depression had interrupted construction of the viaduct with the steelwork still to be erected. The structure is 908 feet long and 312 feet high¹⁸ and it required more than 1,800 tons of steel and 450,000 rivets‡.

It was a job requiring a work force highly skilled at all levels. Discussing the resumption of railway construction generally the then Acting Engineer-in-Chief John Wood had pointed to the difficulties resulting from depression practices:

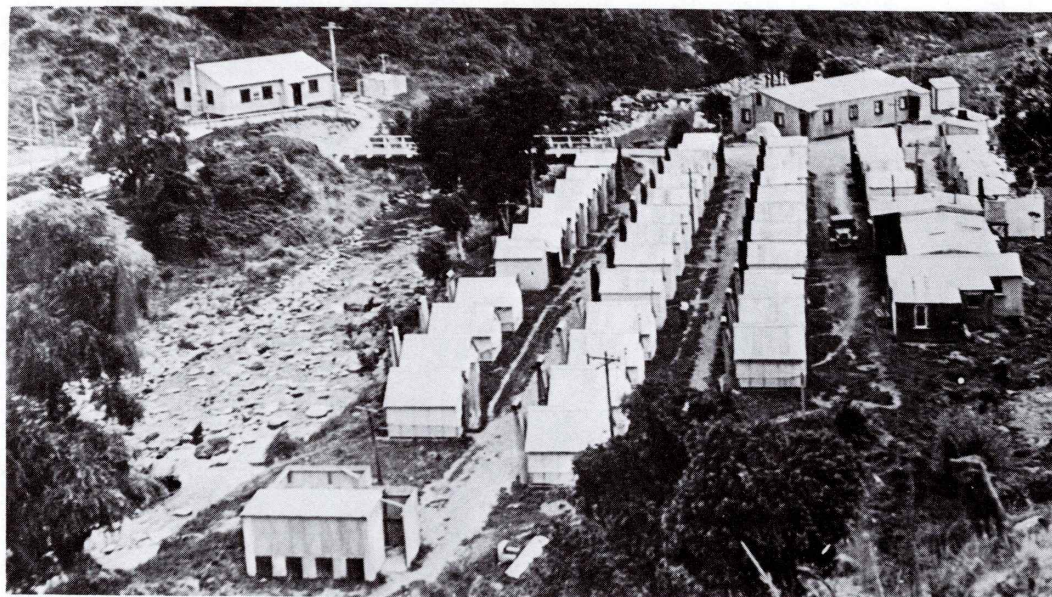
*The agreement applied to workmen on construction works, but not to those regularly employed on maintenance of existing works or services such as surfacemen on roads and highways, workmen engaged in operation or maintenance of hydro-electric or irrigation schemes, tradesmen or others employed on maintenance, etc., of buildings. Neither did it apply to workmen under the control of the Public Service Commissioner. (*AJHR*, 1936, Vol. II, D 1A, p. 5.)

†Section 15 of the agreement provided for 7 statutory holidays per year on full pay after 2 months continuous service, and in addition 2 weeks' leave per year of which 5 days would be paid leave after 12 months of continuous service, and 10 days after 2 years of continuous service. (*AJHR*, 1936, Vol. II, D 1A, p. 9.)

‡This viaduct ranks among the greatest railway viaducts in the world and is rivalled only by the Lethbridge Viaduct on the Canadian-Pacific Railway in Canada, the Gokteik Viaduct in Burma, Hangman Creek and Pecos Viaducts in the U.S. This structure was completely designed, fabricated, and erected by the staff of the department. (Notes on Public Works Department Exhibit at Centennial Exhibition, Wellington, 1940. Unpublished; a copy is in MOW Library.)



Mohaka Viaduct on the Napier Gisborne railway. The deck is 312 ft above the river. Note the men painting in the foreground. *Auckland Weekly News, February 1937.*



No. 4 camp in the Kopuawhara Valley serving the Wairoa Gisborne railway construction. A peaceful everyday day scene taken on 17 February 1938. *Ministry of Works.*

The same area 2 days later. Very early on the morning of the 19th a cloudburst flooded the stream which swept across the flat and wrecked the camp. Altogether here and in other camps 22 lives were lost. *Ministry of Works.*



“... when public works were so drastically reduced during the depression, the great majority of our experienced workmen, overseers, and a great deal of the staff were scattered to the four winds. A great many found other occupations, and no doubt many will return to the Department, possibly to a certain extent demoralised by the trials that they have undergone during that period. It will take some little time to build up the morale, and there will be a certain amount of trouble and difficulty experienced in getting back to our old standard of effort.”¹⁹

It was a credit to Semple's methods and to the Public Works Department's permanent staff that the Mohaka Viaduct was completed in record time well under the estimated cost by a work force that had largely to be trained on the spot. In accounting for the success of the job Semple gave credit to the workshop staff who fabricated the steel so that “Not one piece was even the hundredth part of an inch out”,²⁰ to the engineer in charge “a young New Zealand-trained engineer named Haskell” and above all to workmen who accepted the challenge:

“They were physically fit young men, and I had them trained. They had to walk out on those girders. One slip, and they would have been dashed to death. I tried to inspire them to give of their best. On the second occasion on which I went there I increased their pay to £1 [\$2] a day, because of the risk they were running. On the next visit I gave them 3s. [30c] more. That was consideration money. Those young men were working at that dizzy height with the wind howling round them, and they were hovering on the brink of death. I asked them to put their backs into the job and demonstrate to the country that they were worth their wage. They finished that great task in seven months, working on a 40-hour week, at £1 3s [\$2.30] a day. Moreover, they completed the job for £13,500 [\$27,000]—not £23,500 [\$47,000]—putting up a record in time and efficiency. Not one fatal accident or an accident of any kind happened on that job.”²¹

The Mohaka Viaduct vindicated Semple's belief in the rights of workers to a fair reward for their efforts. And that seemed to be all most workers were asking. But a few were disappointed that the Labour Minister had stopped short of real change. Just as some engineers had been apprehensive about possible workers' committees, some workers had looked forward expectantly to their establishment. Men working on the Mohaka Aerodrome rejected the agreement with the NZWU because they felt it did not go far enough. Semple's reaction to them revealed a strong streak of authoritarianism. He demanded that they not only withdraw their objections but also apologise publicly to him for having doubted the value of what he had done, or face instant dismissal.²² There was some evidence of communist agitation amongst the workmen at the aerodrome, so Semple's reaction can be accounted for in part by his intense anti-communist beliefs, as well as his inherently pugnacious

*Alcohol had been forbidden in public works camps since the 1890s. The department had from time to time had problems in enforcing the rule. Occasionally watchful, concerned citizens would feel it their duty to draw attention to its violation. A typical example is a letter to Semple from a woman living at Rose Villa Cottage, Otorohanga. She was full of praise for the new Government but disturbed by reports of workmen drinking: "I hope you will be able to have this seen to in private and on the quiet and have the police put a stop to it. Men's bodies can't do the jobs on our good metalled roads if they keep on drinking every day and every night as I am told, so I am reporting this in private between ourselves." (P.W. 32/4707, 14 March 1939.) The district engineer commented "from our point of view the allegations generally are extremely vague and have apparently been distorted out of all reason by the women folk in the area concerned".

†The existing instructions had rather grudgingly allowed that "in the case of men who are unaccustomed to hard work, but who are doing their best, they may be placed on day wages for 1 or 2 weeks in order that they may have a chance of making good." (Public Works General Instructions to Officers, February 1935, p. 167, section 526.)

nature. But more importantly the incident showed that he would allow nothing to interfere with the public works programme. Engineers who had feared that the new Minister would be led by the workers were proven wrong. His statement on stop work meetings was unequivocal:

"They can talk on Saturday and on Sunday and they can talk every night of the week, but they are not going to hold meetings on the job and hold up the public works of this country, and so entail unnecessary expense in order to enable some individual to air his views on political questions to his mates."²³

Semple's attitude to the department's employees was tinged with paternalism. A circular issued in October 1937 is revealing:

"Workmen on Public Works are provided with splendid living and working conditions, and have good rates of pay, and the Minister is disappointed that, according to complaints received by him, a few of them have been wasting far too much of their earnings by drinking to excess, thereby damaging the good reputation of departmental workmen generally."²⁴

It is true nevertheless that his sympathetic attitude to public works employees and his insight into their problems did result in drastic improvements for them. He gave a lead to the permanent staff of his department very different from that of his immediate predecessors who had believed in the necessity of sacrificing people to the interests of conservative economic policies. In special instructions to engineers which accompanied copies of the agreement with the NZWU Semple urged that "every workman is to be given a reasonable opportunity to make good".²⁵ He understood, for example, the need for experience before a man could be expected to make a living wage on co-operative contract and he liberalised an existing instruction† accordingly:

- "1. New men arriving on works are to be given day-work for 4 weeks in order to give them an opportunity of hardening up and gaining experience before being placed on co-operative contract unless they elect to go on to contract immediately.
2. While the men are on day-work, they are, as far as possible, to be placed in the charge of an experienced man, who is to instruct them as to the best methods of carrying out the work, so that they and their headman will know how to do work to the best advantage to themselves and the department when they go on co-operative contract . . .".²⁶

By the end of 1936 as a result of the improvements in the conditions of employment on public works projects, complaints were being received from the private sector that the department was attracting workmen who had jobs elsewhere. Instructions had to be issued that those already employed were not to be taken on.²⁷ Early in 1936 Semple announced "now that

workmen will have a decent wage and good working conditions I am confident that the Public Works Department will again become the competent and efficient constructional organisation that it was before practically all of its undertakings were converted into relief of unemployment works . . .”²⁸ But that was only one factor in revitalising the Public Works Department.

The permanent staff had also been affected by the depression. Many had been dismissed, many potential members had never been employed or had been taken on in jobs well below their qualification range. A future head of the organisation holding both engineering and science degrees was employed as a skilled labourer. And a number of engineers were dismissed and then re-employed as labourers. The very fact of a comprehensive construction programme completely altered their position. Once again they could embark on the type of work for which they had been trained. But there were some initial problems to be overcome—not least of which was the wariness with which Semple and some members of the department regarded each other. An editorial in *New Zealand Engineering* on the occasion of his retirement commented that when Semple first took office “he seemed to assume, like many of his colleagues, that engineers, being employers and controllers of labour, must be hidebound Tories, incapable of loyalty to the Government, and needing to be coerced into carrying out the Labour Party’s policy”.²⁹ At least twice in the years immediately preceeding his election to office the engineer in charge had ordered him off public works jobs where he had been investigating conditions and addressing the workmen.³⁰

There does seem to have been some initial resistance to the agreement with the union. The engineer-in-chief emphasised to his staff at the time that “as Union officials are expected to co-operate with our officers, our staff are expected to co-operate with them to the fullest possible extent and carefully consider all reasonable requests or suggestions which they make”.³¹ Later that year in response to complaints about the working of the agreement district engineers and all controlling officers were reminded of “the importance and necessity of complying fully with the terms and spirit of the agreement, and without the necessity of either local branches or headquarters of the union having to draw attention of officers-in-charge of works or the Minister to omissions or breaches of the terms of the agreement”.³²

Although Semple had clearly acknowledged the authority of the controlling officer over his workmen he did himself intervene on occasions when the matter should properly have been left to the engineer and the men concerned. This resulted in a situation where the department’s employees appeared to feel that he was *their* Minister and would support them against the permanent staff when disagreement arose. They were therefore inclined to take even the smallest dispute to him, a situation which, had it been allowed to continue, could only have resulted in a breakdown of the efficient function-

ing of the department. In fact Semple was committed to enforcing his reforms through the traditional hierarchical structure of the department. A section of the agreement with the union stipulated that only as a last resort should disputes go to the Minister. However throughout the early years of his Ministry this matter continued to cause problems and some resentment. A circular issued at the end of 1936 suggested that the officers of the department were themselves partly to blame:

“The Minister during the last few months has received letters from and had interviews with workmen in regard to their employment who stated that they had been advised to take such a course by Departmental engineers and overseers.

In practically every case the matter at issue has been trivial and could have been easily settled by the local controlling engineer.”³³

The circular emphasised that it was quite contrary to departmental practice for officers to advise men to represent their cases either personally or by letter to the Minister. “Only where policy matters are involved should the Minister’s direction be obtained and then only through the recognised channel, that is to say, the district engineer and the permanent head.”³⁴ Possibly permanent officers had recommended such action because they felt insecure and uncertain of the extent of their authority. This insecurity was undoubtedly caused in part by Semple’s own actions.

In spite of the section in the agreement reinforcing the traditional channels for the settlement of disputes and despite Semple’s insistence that those channels be adhered to, he himself sometimes ignored them. He was after all a politician and if approached directly he would often intervene where he felt it to be to his political advantage. This is not to deny his genuine sympathy for his employees. He was in the habit for example of unilaterally raising wages during his inspection trips when he felt the men on a particular job were not receiving adequate reward for their work. This could cause resentment where it was made to appear that an engineer had under-priced a job being done on co-operative contract*. Similarly if workmen chose to appeal direct to the Minister, and they often did, political expediency and his natural sympathy would often incline him to take some action. Direct appeals to the Minister covered a whole range of problems—from the mother who wanted a job for her alcoholic son† to the workman who believed he was not being given a fair chance. In the latter case, the employee was a casual raceman on the Hawkdun irrigation scheme when he wrote to Semple:

“I have been reported (by Mr McN . . . who’s land I was on) to your department for shooting a few rabbits one afternoon. My head man tells me that I will get ‘pushed on’ for it. I took this work on in 1932 I was told I have [*sic*] to live at Blackstone Hill I had to find a house myself which I rented for some time then I had to buy to save it being sold over my head.

*An engineer once in charge of work on the Tekapo Tunnel recalls a typical occasion when Semple visited the job. He went down to meet the men as they came off their shift and, according to the engineer, the tunnellers, knowing Semple would be present, came up from the shaft appearing to be twice as tired as they normally were. The Minister immediately ordered the engineer to reassess the contract so they could earn 50 percent more. When the engineer replied that based on standard rates the men were already earning a fair wage, Semple replied that he was in charge and what he said went. And it did.

†In this particular case Semple consulted the department about the man’s work history, discovered he had been dismissed at least twice for recurring drunkenness and replied to the mother that all the works were fully staffed at that time but that he could perhaps reapply in a month or so. (P.W. 32/4707, 11 May 1938.)

I got behind with my payments when the cuts were on and I was trying to make up a little leeway by getting a few rabbits on Saturday's. [*sic*] There has been no rabbit on this block this season yet which is leasehold held by Mr McN . . . who holds *thousands* of acres of land in different blocks and incidently [*sic*] only employs one married couple.

I patrol 30 miles of race which starts 6 miles from the nearest habitation and your department's rules say that I cannot have a dog on the race for company, but if the runholder whose land the race runs through agreed, it would be alright, but when I asked Mr McN . . . he said no you must want it for some monetary gain. This is only a little incident of the pin pricking and hounding down of the working man by him.

I may state that last year the same man reported me on suspicion which had no foundation for shooting in hours on one of his other blocks and apparently your department takes notice of the likes. I have been commended as a raceman and a worker I am not a worker but just want a sporting chance to get on my feet hoping you will do something for me in this matter."³⁵

Clearly the writer believed that the Minister was more likely than a Public Works Department officer to understand his position and that he was more likely to disregard the strict letter of a departmental regulation.

Semple felt very strongly that the actions of individuals within the public works organisation reflected on him in his position as Minister. This was his rationalisation for becoming involved in disciplinary cases and such like which would normally have been dealt with by the department. On one occasion there had been adverse publicity over Public Works Department officials entering property without the consent of the owner. Instead of requesting a report from the department, Semple had the two staff members concerned—a surveyor and an overseer—brought before him and he handled the whole affair personally. He was, he said "prepared to suspend both of them if there was a tittle of truth in what had appeared in the *Dominion* newspaper because . . . I do not stand for that sort of thing".³⁶ In this particular case the men involved were completely exonerated but he did on other occasions personally fire those he felt deserved it*. Nor was Semple's interest in the performance of departmental personnel confined to the lower echelons. His influence on appointments at higher levels was to cause considerable resentment on more than one occasion.

The problems created by Semple's involvement in personnel matters were offset by the growing realisation of the department's permanent staff that Semple had a genuine enthusiasm for public works and a total commitment to their efficient construction. His belief that society could be transformed by improving the physical condition and environment of New Zealanders gave public works an idealistic rationale that contributed to a new atmosphere of excitement and endeavour within the department.†

*A circular issued in 1937 to all engineers read: "During his recent tour of the South Island the Minister of Public Works dismissed . . . from the South Island Main Trunk Railway construction works at Claverley, and has now directed that he shall not be employed again on any of our works." (Public Works Circular, No. 1937/27.)

†Something of this atmosphere can be sensed in a 1937 circular from the engineer-in-chief requesting information on the year's activities from his staff: "It will be appreciated by engineers that the year to be reviewed has been one of outstanding achievement on the part of the department and it is my wish that a special effort be made to show by means of this year's Public Works Statement full information of what has been done." (Public Works Circular Memorandum, 28 June 1937.)

Furthermore their new Minister recognised that during the depression the professional staff had been expected to use archaic methods which many of them found “most unpleasant and distasteful”.³⁷ He determined that they should have all the plant and machinery necessary “to undertake work in the way it should be carried out in this enlightened age.”³⁸ The mechanisation of the department in the late thirties has been hailed as one of the great achievements of the Semple ministry. By the end of the decade heavy machinery from all over the world was operating on public works throughout the country. The depression had at first hampered then totally destroyed the programme of mechanisation begun in the early twenties by Coates. Semple in his inimitably graphic language described what had happened to the equipment that was being used for railway construction when the Coalition Government called a halt to it: “Some material was sold for a song, and gear that could have been sold was left along the line to rust, whilst other gear was thrown away. Rails that had just been laid were torn up, and huts, sheds, and so on, were demolished and sold for a comparatively low figure. Tools were thrown into rivers or buried. It is not an exaggeration to say that, because two and a half years ago I saw the handles of picks and shovels protruding from the Buller River. . . .”³⁹

What little material was not abandoned on the site was usually despatched to the Waitaki hydro station—the only major construction project continued throughout the depression. However without adequate funds to maintain it most of it had to be left to rot along the banks of the river*. By 1935 a few new pieces of equipment were being distributed but on the whole the pick, shovel, wheelbarrow, and handcart were still the usual tools.

The introduction of machinery caused a dramatic reduction in the time taken to complete major projects and in their cost. Nowhere was this more obvious than in aerodrome construction. During the depression unemployed on relief work had used “long-handled shovels, hand-sharpened spades for cutting turf with, wheelbarrows for wheeling filling with, and sometimes boards to wheel on when the mud became too deep to push the barrows through.”⁴⁰ Constructed by those methods the Nelson aerodrome would have cost \$350,000 and taken 3 years to complete⁴¹. Using earthmoving equipment and other contemporary machinery the job was done in 16 months for \$70,000.⁴² To those who criticised the cost of importing the necessary machinery or who argued that mechanisation would deprive men of much needed work, Semple replied that the reduced costs of mechanical construction more than covered the expense of the machinery involved and savings made on one job could then be used to finance another and thereby create extra work. He did admit however that some works were beginning which “would not have been undertaken at this stage had it not been for the fact that there are thousands of men seeking employment”.⁴³

*An engineer at Waitaki in the final stages of its construction remembers that when the site was cleared in 1936–37 after completion of the job, all the old equipment was supposed to be gathered up for shipment as scrap to Japan. However the overseer in charge showing commendable foresight decided that rather than be responsible for sending it to Japan he would dump it all in the river—which he did.



A steam shovel with caterpillar mounting. c. 1939. *Thelma Kent. Turnbull Library.*

Peter Fraser (just defeated as Prime Minister) reads the telegram, while Bob Semple and Walter Nash look on. *Evening Post* 6 December 1949.



"It's from the new boss—he's going to turn the place into a goldmine!"

Sample further argued in favour of mechanisation on humanitarian grounds. He spoke of "transferring laborious work from the shoulders of men to the cranks of machines".⁴⁴ A favourite story of his concerned a roller used on the Palmerston North aerodrome:

"There were twenty-six men pulling that roller all day long, and the previous Government defended it by saying that such methods absorbed the unemployed . . . The first day I visited the aerodrome and saw this roller with twenty-six men pulling it I asked, 'What curiosity is this?' And the Engineer replied that it was their method of construction. I said, 'Get rid of it'; and he asked, 'What will we do with it?' I said, 'Roll it down into the bush, and some day we will place it in the museum as an example of what sort of jackasses lived in our time.'"⁴⁵

Sample's commitment to mechanisation was unquestionable. Those who opposed him he dismissed as men with "wheelbarrow minds". But Public Works Department staff from the thirties recall that it was no easy task to persuade him to agree to expenditure on some of the more expensive items of machinery. T. G. Beck an engineer in charge of irrigation in Canterbury wanted a Ruth dredger for work on the canals and water races. It was to cost \$30,000. Sample was not easy to convince of its necessity but finally he agreed:

"All right Beck we'll get it, but by Christ if it doesn't work I'll bloody well crucify you."⁴⁶

That was typical of him, once persuaded he would wholeheartedly support some new idea, but he always made sure there was someone to blame if it went wrong.

Probably no Minister of Public Works with the exception of Seddon utilised his position to such political advantage as Sample. Like Seddon he travelled from job to job all over the country and he had a natural flair for publicity. In the mechanisation of the department he recognised that he had a wonderful subject for publicity. The following Press Association report revealed his ability to effectively dramatise the progress of his department:

"The Minister of Public Works, the Hon. R. Sample, symbolised his dislike of antiquated constructional methods in a striking way yesterday afternoon, when turning the first sod at the Christchurch city airport at Harewood. After a typical verbal attack on the old way of doing things, he mounted the driving seat of a huge caterpillar tractor and scoop and drove straight over an old wheelbarrow and shovel, crushing both completely."⁴⁷

In fact such antics reflected a widespread fascination with the new machinery. An article in 1939 in the *New Zealand Herald* captured something of the general wonderment at heavy equipment.

"Modern machinery can move mountains, as was proved to several hundred Aucklanders who assembled on the site of the new military aero-

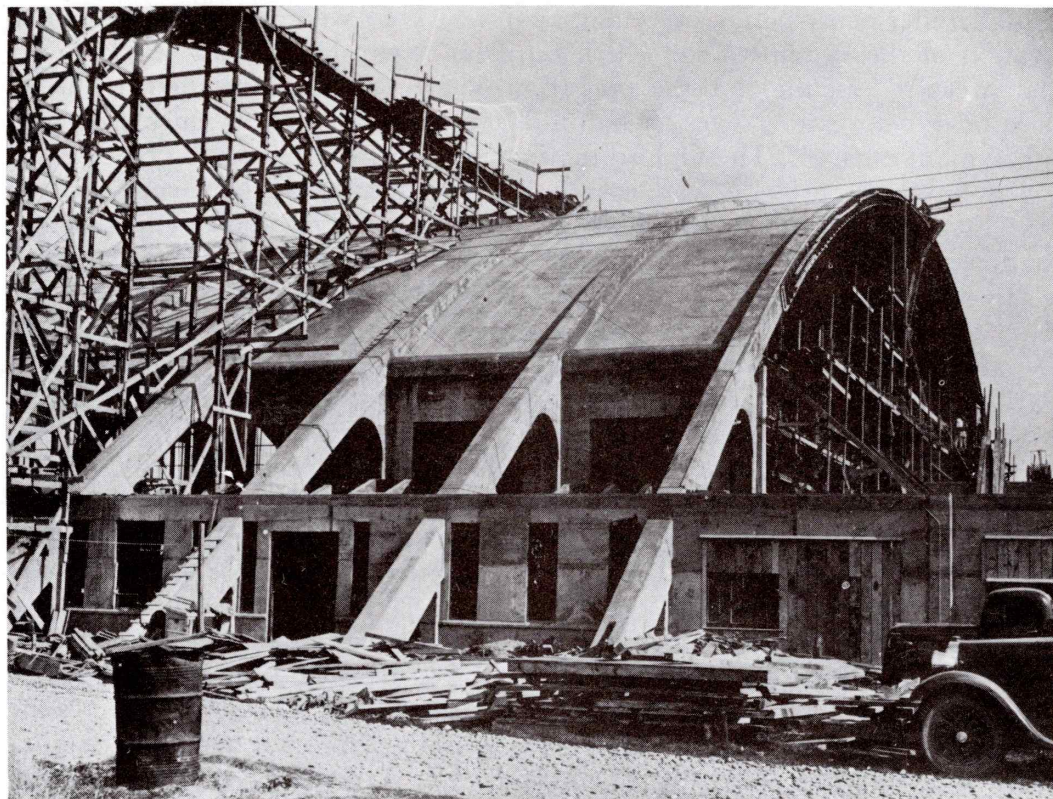
drome under construction at Whenuapai, . . . They were treated to a demonstration of the rapidity with which farm lands can be transformed into the flat areas so essential for the operation of aircraft, and watched a hillock disappear before their eyes as half-a-dozen snarling tractors burrowed into it like giant ants. . . . The Oxford dictionary . . . sums it up neatly by describing a bulldozer as 'one who coerces by violence,' and after watching the bullying manner in which these machines shouldered their way through inoffensive obstacles, spectators could not but agree with this definition."⁴⁸

His efforts to publicise the activities of his department occasionally misfired. After 2 years in office he decided to have made a film of the Public Works Department at work because he thought that honourable members in Parliament and New Zealanders as a whole "without actually seeing all the works in progress and the machinery now operating throughout New Zealand, could not visualise the efficiency of this plant in dealing with the construction programme of the department."⁴⁹ His political opponents denounced the film as blatant party propaganda and their opinion must have been reinforced by its timely release for general exhibition a few months before the 1938 general election.⁵⁰

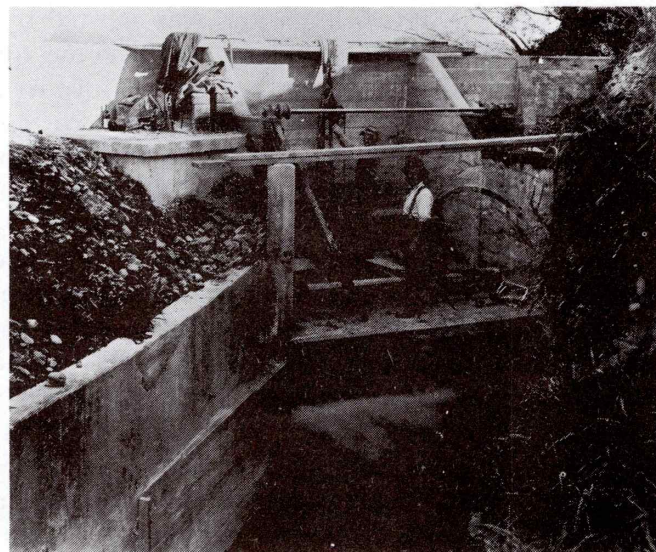
Aerodrome construction was the one new activity that had been undertaken by the department during the depression. By 1936 it had assumed such proportions that a separate branch was formed to deal solely with it—the Aerodrome Services Branch. The formation of the branch justified the foresight of one of the department's engineers, E. A. Gibson, who, recognising that aviation would become a major industry in New Zealand and that the Public Works Department could be called on to construct aerodromes, qualified as a pilot and pioneered the work of constructing airfields.* He was placed in charge of the new branch and was assisted by D. O. Haskell, E. C. Smart, and A. M. Prichard, who had also become qualified airmen. The general policy was that the local aerodrome or airport authorities (usually the local municipality or aero club) selected and acquired suitable land subject to the approval of the Public Works Department's aerodrome engineer. Construction was then undertaken by the Government through the Public Works Department.

It was a highly specialised job requiring particularly skilled survey parties. With experience special methods were developed to determine satisfactory levels, grades, and contours for the runways. In those days of light aircraft wind directions were critical and usually three runways were required to provide for all contingencies. Surfaces, however, needed to be only tough grass. The development of a grass suitable for the task was the result of inter-departmental co-operation. The Grasslands Division of the DSIR seconded a team of scientists to the Public Works Department and engineers and scientists together were responsible for making grass runways a success for so long.

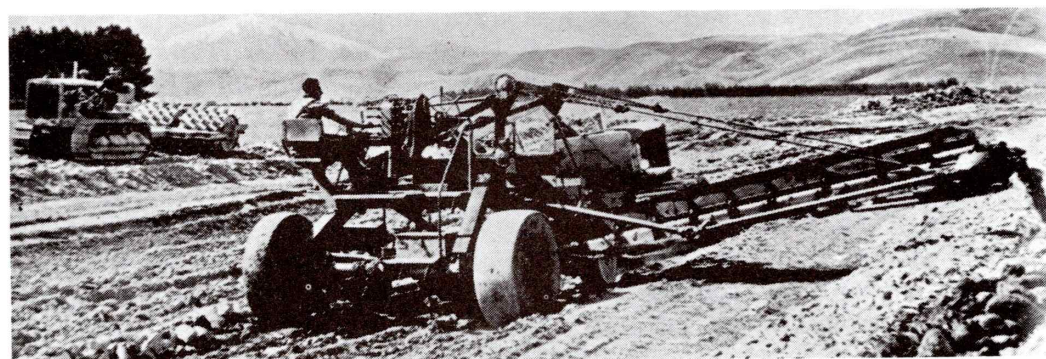
*Gibson was actually instrumental in persuading the Government of the need for an extensive aerodrome building programme in the early thirties. While supervising relief workers at Wigram he recognised the suitability of aerodrome construction as relief work. He organised a deputation from the New Zealand Aero Clubs to the Minister of Defence and put forward a scheme for building an aerodrome near every town of any size. The Government liked the idea and Gibson was transferred to head office to supervise this work.



ABOVE: Several of these reinforced concrete aircraft hangars were built at major RNZAF stations. 1939. *Evening Post*.



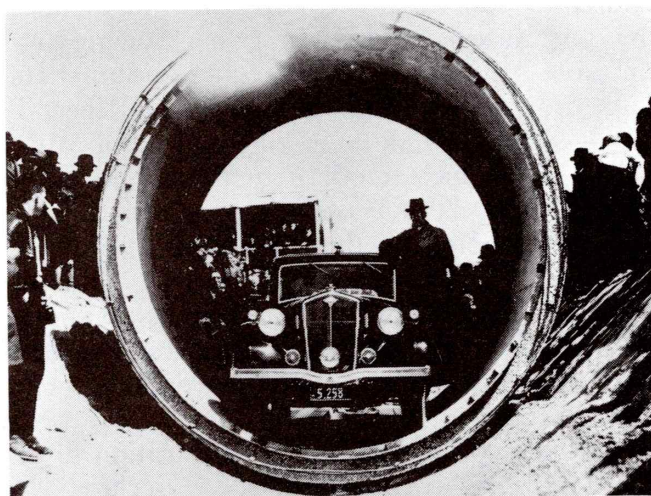
RIGHT: Redcliffs irrigation scheme, South Canterbury. Control structure at intake on northern bank of the Waitaki River. 1936. *Ministry of Works*.



ABOVE TOP: Rangitata irrigation schemes. Minister of Public Works Robert Semple addressing a gathering during an inspection in November 1937. *Auckland Weekly News*.

ABOVE MIDDLE: A sheep's foot roller and an elevating grader at work on the main race of the Rangitata irrigation scheme. *Auckland Weekly News*, November 1937.

RIGHT: The Minister of Public Works stands beside his car inside one of the 12 ft diameter pipes for the Surrey Hills siphon. It is designed to take the whole flow of the main race. October 1940. *Green and Hahn*.



D. O. Haskell, one of the aerodrome branch engineers, once boasted that E. A. Madden, the head of the DSIR team, could make grass grow on a billiard ball. To confirm his colleague's boast Madden presented him with a billiard ball covered with growing grass!⁵¹

However even before the war began in September 1939 the growing size and weight of aircraft meant extending and altering runways, and a change to hard surfaces. The developments in the first 4 years of the branch's existence were notable. But it was to the branch's credit that when war did break out the situation was reasonably satisfactory, for the department had worked with the Air Force in determining requirements and planning was well advanced although there was much construction still to be done. At one stage between 1937 and 1939 the Public Works Department had approximately 80 aerodromes in the planning stages, under construction, or in operation. Such extensive activity was made possible by the use of heavy mobile earth-moving equipment—the tractor, carryall, and bulldozer particularly. Shallow cuts and fills and comparatively long leads made this equipment ideal for aerodrome work.

Irrigation was another activity which flourished in the early Semple years and profited enormously from mechanisation. The decade of the thirties saw the emphasis in irrigation shift from the valleys of Central Otago to the plains of South Canterbury. This trend had begun before Labour came to office but as with the public works programme generally it was greatly accelerated after 1935.

The Central Otago irrigation schemes usually depend on dams to conserve winter flows of water for use in the dry months. By contrast the Canterbury schemes draw water from major rivers with sources in the Southern Alps. They do not require dams but the intake structures can be complex and costly, the main races are often major undertakings and major structures may be necessary to cross rivers flowing from the foothills and to avoid unstable ground. The Ashburton–Lyndhurst and the Mayfield–Hinds schemes both draw water from the Rangitata River. The diversion race constructed for the purpose is 42 miles long and has a capacity of 1,000 cu ft per second.* Without the most modern methods and equipment the scheme would not have been a viable economic proposition. As Semple put it, if the race had been constructed by the old system of entirely manual labour “the existing generation of farmers would be dead, and the new generation would have dropped dead when they got their first water bill.”⁵²

Most of the Public Works Department's resources between 1936 and 1939 were however concentrated on roading. Semple's request for a review of public works on which to base a 3-year programme had revealed a most unsatisfactory state in the administration of arterial routes. Although under the Main Highways Board, roads declared “main highways” were heavily

*Or, in every day language, 22½ million gallons per hour.

subsidised, with the increase in heavy long-distance road transport it became clear that routes connecting main centres could not be regarded as a county responsibility. The Main Highways Amendment Act 1936 made provision whereby the board could from time to time, with the approval of the Minister of Public Works, classify any main highway as a State Highway. The Main Highways Board then accepted full financial responsibility for them. Upgrading these roads usually involved their widening and straightening, sealing of the surfaces and where necessary strengthening or replacing bridges. Ironically this extensive reconstruction of the highways met with considerable opposition. Semple put such criticism into perspective when he pointed out that most of it occurred when earthwork was in full swing and before the full effect of the proposals was apparent to the inexperienced observer. He had not, he noted "experienced a single instance where, after completion, an improvement work has been held to be unnecessary or unjustified."⁵³ Such improvements, coming as they did at a time of increasingly sophisticated traffic control methods, were accompanied by a significant drop in the number of accidents and fatalities on the roads. A major policy proposal of the first Semple ministry was the elimination as rapidly as possible of all level crossings. But putting the policy into practice in and around towns and boroughs



Accommodation for workmen at Tawatapu between Pukerua Bay and Plimmerton. They were constructing a major deviation of No. 1 State Highway. 1937. *Evening Post*. Turnbull Library.

proved to be difficult. Where the most valuable land in a town is to be found close to the level crossing with the business premises clustered around the local railway station, it is a question of economics, as high property values inhibit alterations.⁵⁴ However both train and road speeds in a town are slower and level crossings more obvious than in the open country, where speeds are high and crossings can occur in unsuspected places. In towns modern practice is to install physical barriers which close automatically when trains are due.

A major undertaking in road construction during this period was the Milford Sound link. In 1890 R. W. Holmes (later engineer-in-chief) had made a survey of a possible route from Lake Wakatipu to Milford Sound. His report was a model of its kind and conveyed a real appreciation of the magnificent countryside—the more effective because, as befits the style of an engineer, his descriptions were so matter of fact*. He concluded that the construction of a road was quite feasible; that the best route was via the Greenstone, Hollyford, and Cleddau Valleys; that Homer Saddle was the only practicable way of passing from the Hollyford into the Cleddau Valley and that the saddle must be tunnelled through.⁵⁵

*Those who have always believed engineers to be philistines in relation to the environment would be surprised at some of Holmes' comments: "With care" he wrote, "a road could be constructed so as to be completely hidden and not interfere with or detract from the beauty of the lake, for in the surrounding bush its principal beauty lies." (N.A., W 1, 1890/520 p. 5.)

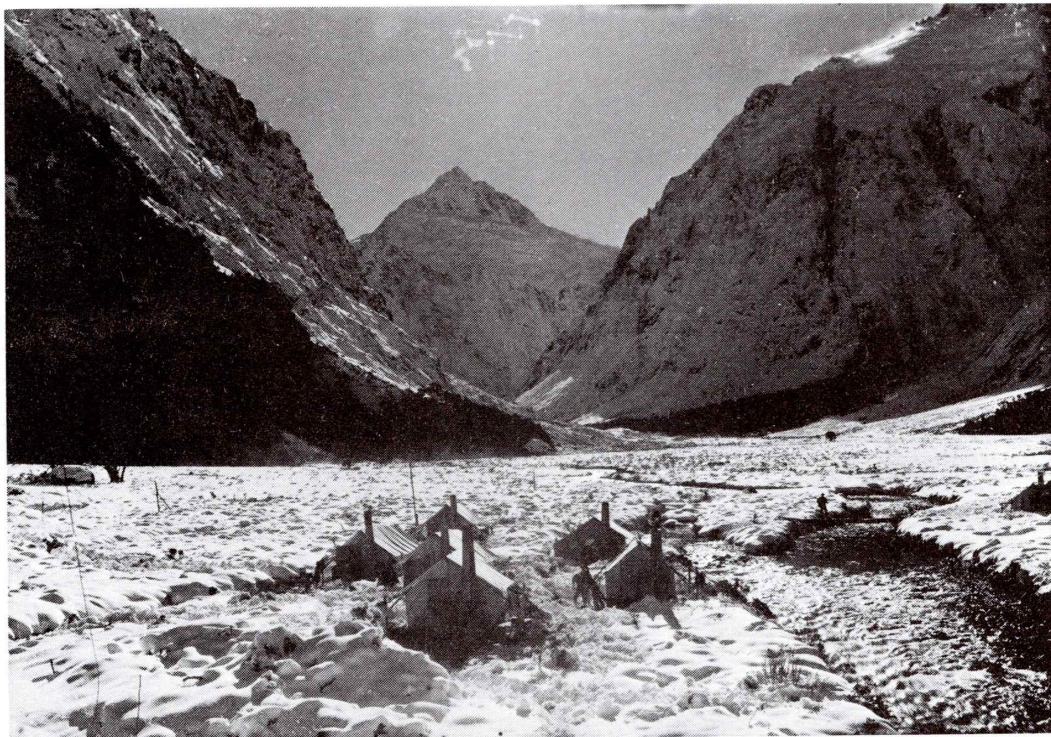


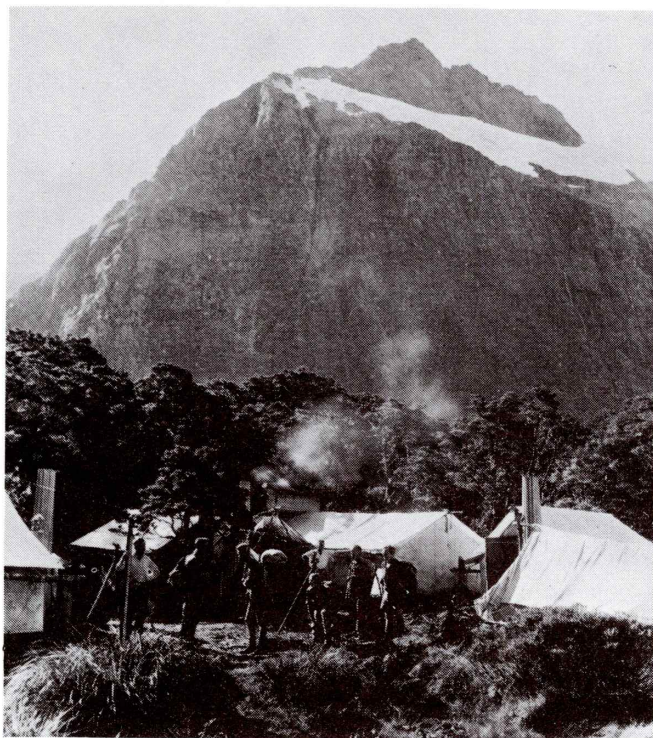
Heavy rock work on the Milford Sound road. All the rock on the right could be part of one boulder deposited by the ancient glacier. *Auckland Weekly News*, 1935.



Widening the Waikaremoana Rotorua highway near Mokau Falls, 1937. *Evening Post*.
Turnbull Library.

On the way to Milford Sound the road leaves the bush for the open. A winter scene at an advance camp on Monkey Flat in 1935. *J. H. Christie*.





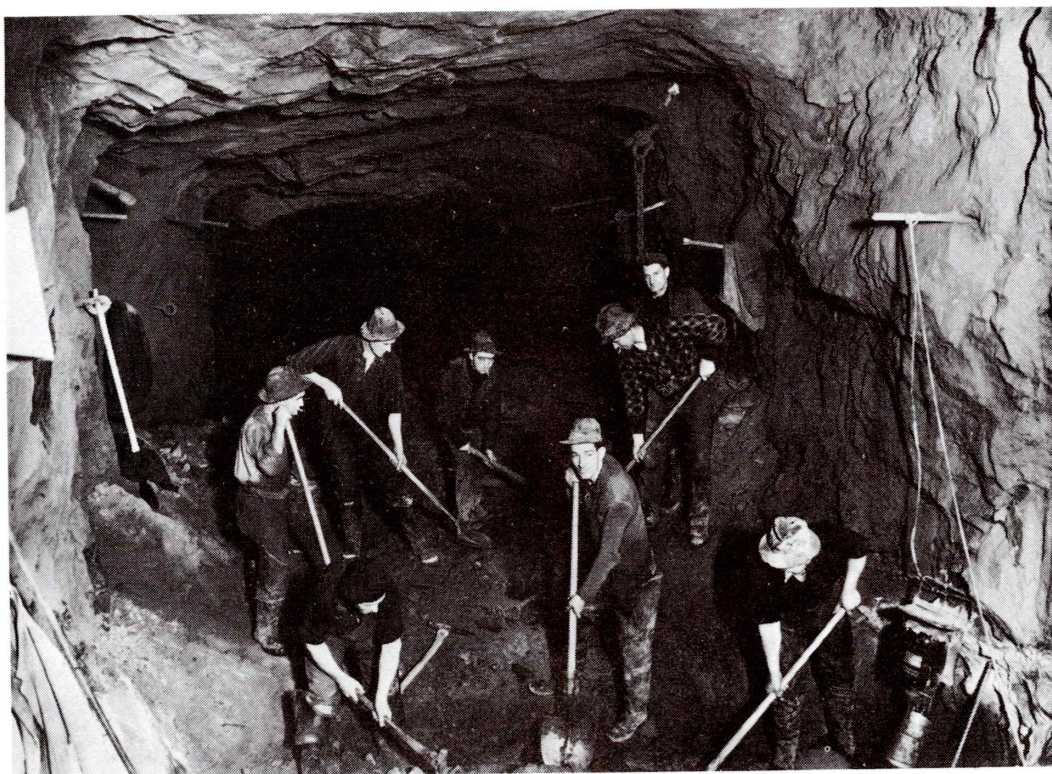
LEFT: The party leaving the survey camp near Homer Forks at the foot of Mount Talbot to cross the Homer Saddle to make triangulation observations in the head of the Cleddau. *Auckland Weekly News*.

BELOW LEFT: Milford Sound Road. On the descent to the Hollyford coming down from the Divide at the head of the Eglinton Valley. 1935. *Auckland Weekly News*.

BELOW RIGHT: Milford Sound road; formation work between the Hollyford River and the hillside. The valley which drains into Falls Creek is in the background. *J. H. Christie*.



His report however was shelved and it was not until nearly 40 years later that mounting unemployment necessitating relief work with high labour content led to a start on the project, but from Te Anau, not Lake Wakatipu.⁵⁶ By the middle of 1933 formation work was approaching the head of the Eglinton and a party was sent in to make a trial survey and estimate the cost of completing the route. After some considerable difficulties* the survey was completed and the analysed results showed that the best route was through the Homer and Upper Cleddau Valleys rather than via the Gertrude Saddle†. In July 1935 five men began excavating for the approach to the Homer Tunnel with shovels and wheelbarrows. Public works in New Zealand have seldom been carried out in such a harsh environment. At that time vehicle access stopped some 6 miles away, and it was 2 months before the first pack horses reached the men's camp. The site was 3,000 feet above sea level, surrounded by mountains of up to 7,000 feet, and subject to heavy snowfall.



The heading for the Homer Tunnel being driven through solid rock. On the right a sump is being excavated to collect water, which was then pumped and discharged outside. About 1937. *Hall Raine. Turnbull Library.*

*John Christie recalled for the author some of the experiences of that survey party which began work in October 1933:

"On 22 December it had rained all day and about 2 a.m. next morning the camp was awakened by a terrific thunderstorm. The vivid flashes of lightning, some seeming to last for several seconds, were followed almost instantaneously by the terrific claps of thunder, reverberating and echoing from the sheer rocky mountain sides. The tent sites were all of 5 feet above the ordinary river level, but the cook when he flashed his torch saw the floor awash and his boots floating in the current. He managed to grab one but the other sailed out of the door before he could secure it. He spent the rest of the night on the mess table in his galley. Sometimes, these storms herald an improvement, but on this occasion the rain continued for 4 days." ("Memoirs" unpublished; MOW Library, p. 2.)

†Some idea of the problems involved in the survey can be gathered from the following account of its final stages:

"By early 1935 the permanent survey was approaching the Homer and it was necessary to plan for the accurate triangulation required to fix line and levels so that preliminary work for the tunnel could be started. This triangulation called for the establishment of seven observation stations, two in the Homer, two on the saddle ridge and three in the Cleddau. Now the basic difficulty of communication became acute.

continued on p. 158.

Continued from p. 157.

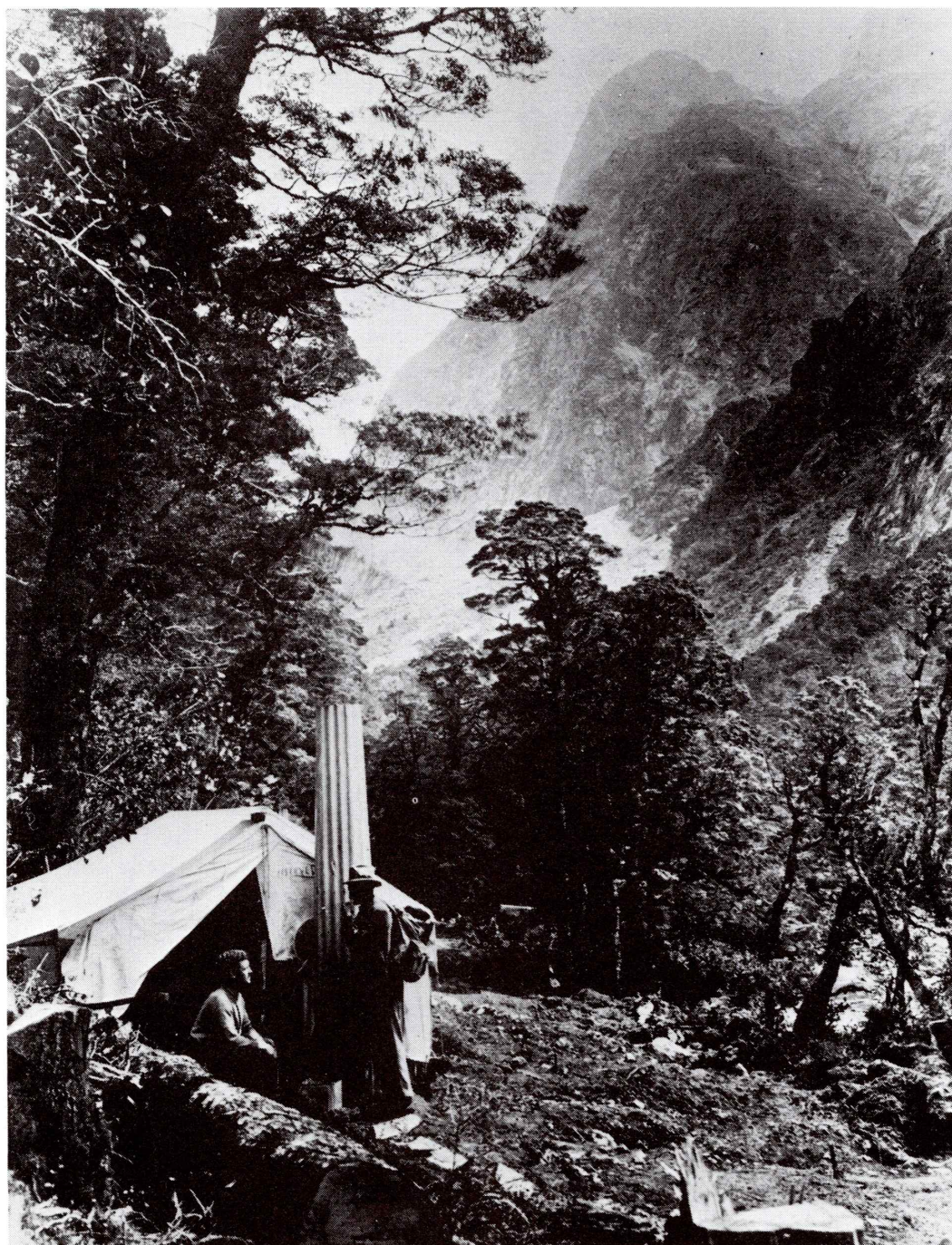
Even with a track right up the Cleddau, a good knowledge of the Grave Talbot route and given suitable weather, it was still a full day's journey between the survey camps of the Upper Hollyford and the Upper Cleddau. There was a possible alternative. Fixed ropes had been placed on the worst portions of the Grave Talbot route; with similar aid could the Cleddau face below the Homer Saddle be made climbable? To resolve this question several hundred feet of manilla rope was ordered and the blacksmith sharpened assorted lengths of discarded drill steel. The result of the first day's work on the face was to show that there was a better route a little to the north. The work already done was abandoned and the end of the second day on the revised route saw the climbers within about a hundred feet of the top of the scree slopes which gave pedestrian access to the Cleddau. Then on Saturday 16 February three of the party fixed the remaining rope and went on to make the first crossing to Milford Sound via the face below the Homer Saddle. Apart from solving the difficulty with the survey this direct route was subsequently used for a mail service to the survey party at Milford and later for the erection of a telephone line for use during the construction of the tunnel." (J. H. Christie "Pioneering the Milford Sound Road" p. 4, unpublished, MOW Library.)

After a snowstorm the men could find their excavation filled up with drift snow. The area received 250 inches of rain per year and in season avalanches thundered down the mountain sides, creating destructive winds of terrific force.

With the depression receding and a change of government living conditions and working methods improved. But no human agency could alter the terrain or the climate. Tragedy struck in July 1936 when an avalanche wind wrecked a partly completed building near the portal and killed a tunneller.⁵⁷ Several others were injured. Avalanches were not anticipated as early as May, but it was in May the following year that the wind resulting from one wrecked some buildings and killed the engineer and the tunnel overseer. After this the work was temporarily closed down until the following November.⁵⁸ Covered ways of heavy timbers were erected to protect the



Tough going with granite hard rock in the Hollyford when building the Milford Sound road. Drilling to place explosives one man holds the sharpened steel rod, turning it slightly between each stroke, while the other swings the hammer. 1935. *Auckland Weekly News*.



A workman's camp alongside the way cleared for the Milford Sound road. On the right the slopes rise for a height of 1 mile to the summit of Mount Christina. *Auckland Weekly News*.

workers moving between camp and the job, and near the tunnel a heavy reinforced concrete shelter was built to protect workmen and the roadway.

Conditions inside the tunnel were no more congenial than those outside. A great deal of trouble was experienced because of water entering through crevices and as well as getting frequently wet the men had constantly to be on the lookout for rockfalls. Attracting men to work in such places was not easy and by the end of the thirties public works throughout New Zealand were suffering from lack of skilled personnel. In some cases like that of the Homer Tunnel the department was forced to call in a contractor to complete the job. The contract was to drive a 12-ft-wide by 9-ft-high heading through the 3,300 feet still to be pierced. Work commenced in November 1937 and the heading was holed through in February 1940. War conditions prevented completion of the work, as it did in the case of most public works other than defence.

The Milford Sound Road and the South Westland – Otago link over the Haast Pass (which also had its beginnings in relief work) were the last two great roads to open up inaccessible parts of New Zealand. They stand as monuments to both the old and new methods of construction. Begun because of the availability of cheap labour, they were completed with the most modern contemporary machinery. By the time they were opened they had straddled several distinct periods in the history of the Public Works Department, yet they emphasise the basic continuity in its development. Even the first Semple years were periods of acceleration rather than innovation. The years 1936–39 contrast dramatically with the immediately preceding 5, but when viewed in the perspective of the department's total lifespan their significance is somewhat reduced. Yet they were undoubtedly years of great growth and expansion. In some branches of the department the growth was immediately obvious. In others, such as the hydro-electric division, some years of planning were necessary before work could resume on any significant scale. The outbreak of war in September 1939 was to divert the department into quite different fields.

REFERENCES CHAPTER 7

- ¹ *AJHR*, 1936, D 1, p. i.
- ² *NZH*, 18 December, 1933, p. 13.
- ³ *AJHR*, 1936, D 1A, p. 1.
- ⁴ Public Works Circular, 0/1/198, 21 May, 1936.
- ⁵ *AJHR*, 1936, D 1A, p. 2.
- ⁶ *Ibid.*, D 1, p. iv.
- ⁷ *Ibid.*, D. 1B, p. 1.
- ⁸ *Ibid.*
- ⁹ *NZPD*, Vol. 245, 22 May 1936, p. 337.
- ¹⁰ *AJHR*, 1936, D. 1, p. i.
- ¹¹ MOW, tape 1, side 1, track 2, I. W. McKinnon.
- ¹² *AJHR*, 1936, D. 1, p. i.
- ¹³ *Ibid.* D. 1A, p. 12.

- 14 *Ibid*, see clauses 22–25.
- 15 *Ibid*, p. 3.
- 16 *Ibid*.
- 17 *Ibid*, 1937, D. 1, p. i.
- 18 *Ibid*, p. 28.
- 19 *Ibid*, 1936, D. 1B, p. 6.
- 20 *NZPD*, Vol. 248, 22 September 1937, p. 288.
- 21 *Ibid*.
- 22 *Ibid*, Vol. 246, 4 August 1936, pp. 248–54.
- 23 *Ibid*, p. 250.
- 24 Public Works Circular, 1937/75, p. 2, 20 October 1937.
- 25 *Ibid*, 0/1/201, 27 May 1936.
- 26 *Ibid*, 0/1/207, 30 May 1936.
- 27 *Ibid*, 0/2/24, 23 September 1936.
- 28 *AJHR*, 1936, D. 1A, p. 5.
- 29 *NZE*, Vol. 4, 1949, p. 1063.
- 30 Ritchie in interview with the author.
- 31 Public Works Circular, 0/1/201, 27 May 1936.
- 32 *Ibid*, 0/1/236, p. 2, 14 October 1936.
- 33 *Ibid*, 0/1/248, 2 December 1936.
- 34 *Ibid*.
- 35 Public Works file (Dunedin), 6/4, 16 July 1936.
- 36 *NZPD*, Vol. 248, 20 October 1937, p. 982.
- 37 *AJHR*, 1936, D. 1, p. ii.
- 38 *Ibid*.
- 39 *NZPD*, Vol. 248, 22 September 1937, p. 286.
- 40 Patchett, C. M., “Some Historical Notes and Recollections” 1971, p. 24 (unpublished, MOW Library).
- 41 *NZPD*, Vol. 248, p. 287.
- 42 *Ibid*.
- 43 *Ibid*, Vol. 246, 7 August 1936, p. 375.
- 44 *Ibid*, Vol. 248, 22 September 1937, p. 288.
- 45 *Ibid*, p. 287.
- 46 MOW, tape 1, side 1, track 1, J. O. Riddell.
- 47 *A.S.*, 25 February 1937, p. 6.
- 48 *NZH*, 3 April 1939, p. 13.
- 49 *AJHR*, 1937–38, D. 1, p. xxxvi.
- 50 *NZH*, 8 December 1937; 10 September 1938.
- 51 Haskell, D. O., “Memoirs” 1971 (unpublished, MOW Library).
- 52 *NZPD*, Vol. 254, 6 July 1939, p. 204.
- 53 *AJHR*, 1938, D. 1, p. x.
- 54 *Ibid*, 1937, D. 1, p. 167.
- 55 *N.A.*, W 1, 1890/520.
- 56 *AJHR*, 1930, D. 1, p. 55; *Ibid*, 1931, D 1, p. 42.
- 57 *NZE*, Vol. 2, pp. 488–90, White, D. U., 1947, “The Homer Tunnel”.
- 58 *AJHR*, 1938, D 1, p. 233.

CHAPTER 8 / *The War and Its Aftermath*

“Talk of a new-born world, a new economic system, or of equity and justice for all was mere lip service unless they got down to the fundamentals of the task that lay ahead. . . . the way to deal with those great problems was to create an organisation, without which nothing worth while could be achieved.”

Bob Semple quoted in the *Evening Post*, Saturday, 17 July, 1943, p. 4.

The declaration of war in September 1939 caused an immediate diversion of men, equipment, and materials from regular public works to various projects urgently required by the Army, Air Force, and Navy. As a result, some public works were curtailed, others closed down altogether, at least temporarily; but the most drastic reduction in public construction for civil purposes was still to come. In fact it is possible to discern in the first 2 years of the war new directions in public works which were to dominate the post-war era.

By the end of the thirties development of New Zealand's hydro-electric resources was well under way again. By 1940 work was in hand on the extension, investigation, or construction of some 10 developments*. But the annual report for 1940 noted that “the demand for electric power still continues to increase, and some difficulty has been experienced in meeting all requirements during the months of peak loading”.¹ Throughout the forties and fifties generation of electric power was to lag constantly behind the demand for it. It was this that prompted Semple to announce that hydro-electric construction would be one of the four main public works activities retained† so long as sufficient manpower and machinery were available and essential defence works were not jeopardised.² By 1942 however work on most of the hydro schemes had been suspended.

The Soil Conservation and Rivers Control Act of 1941 pointed to another area which was to assume increasing importance in the late forties. At the time it was considered to be one of the most advanced pieces of legislation of its type anywhere in the world, bringing together soil conservation, river control, and drainage problems under unified administration both at national and local levels. The Act provided for the establishment of the Soil Conservation and Rivers Control Council as the central authority responsible to the Minister of Public Works. District catchment boards were authorised to plan and carry out works under the council's general supervision and direc-

*Additional generators were being installed at Waitaki and Arapuni. Investigations were under way or almost completed for schemes at the outlet of Lake Tekapo and on the Waikato River. Preliminary investigations were being done at Whakamaru and Ohakuri. Construction work was at various stages at Highbank on the Rakaia River, on the Cobb River scheme, at Karapiro and at Piripaua.

†The other three were railway construction, irrigation development, and land-improvement schemes. The latter two were seen as directly related to the country's war efforts because they affected primary production.

tion. To assist the council in carrying out its functions a headquarters staff was to be established comprising mainly specialist officers seconded from the Public Works Department*. Despite the Government's desire to establish the council as soon as the Act was passed, the effect of the war was to delay any action until 1942.³ Despite the urgent problems of exhausted soils on hill country, deteriorating pastures, widespread erosion, increasing run-off, and mounting damage to the lowlands by flooding and river erosion—all problems which were severely exacerbated by the prevailing methods of farming—little progress was made by the council until the war ended†.

Housing was another area in which the department was peripherally involved at the onset of the war and in which it was to play a major role from the mid forties. To carry out its policy of providing State houses, the Labour Government had set up a Housing Construction Department under the immediate control of the Parliamentary Under-Secretary to the Minister of Finance, but administered as part of the State Advances Corporation. Although the planning, design, and building of the new houses was undertaken entirely by the Housing Department, the Public Works Department was required to prepare the sites for the new department. This included the survey,



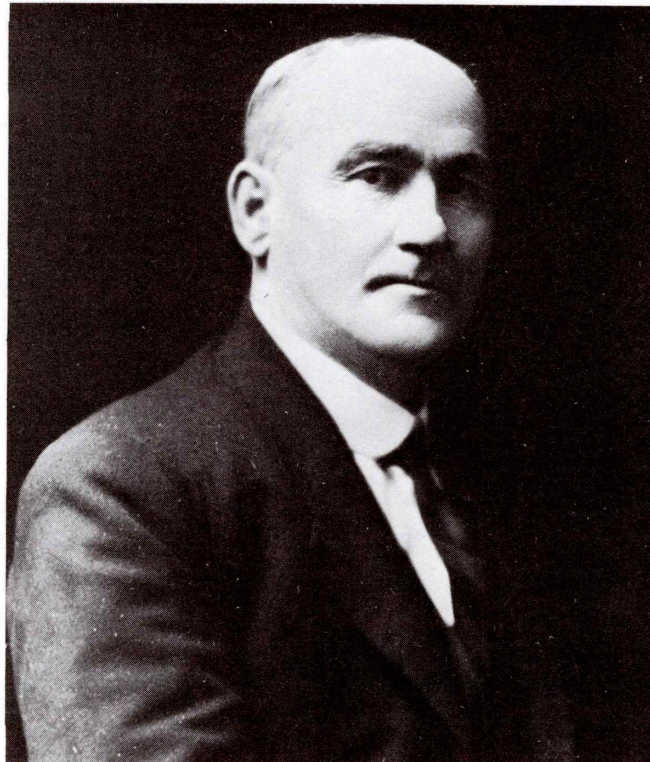
State housing, Lower Hutt. Street scene showing individuality of designs. *Ministry of Works.*

*The Public Works Department had been concerned with river control both generally and in particular cases for the protection of road and railway works, etc. . . . since the 1870s. A more detailed account of the development of this type of work than is possible in this history is available in Acheson, A. R., *River Control and Drainage in New Zealand*, Wellington, 1968.

†John Porter who joined the Public Works staff in 1946 as a soil conservator remembers feeling at the time that no one really had the faintest idea what a soil conservator was or what he was supposed to do. (M.O.W. Tape 1, Side 2, Track 1.)

planning, and construction of new roads and the installation of storm water, sewerage, and water reticulation services. When the wartime emergency necessitated a severe rationalising of services,⁴ it became apparent that the two departments had overlapping functions and the way was prepared for the incorporation of the Housing Department as a division of the Public Works Department. By the end of the forties housing accounted for almost 25 percent of the public works budget but for a period during the war housing construction was forced to taper off almost completely.

As defence expenditure rose rapidly and normal public works expenditure declined the department became increasingly the constructional agency of the armed services. By the time its new Minister, H. T. Armstrong, made his first annual report in 1941 over one-third of its activities involved special war work carried out at the request and on behalf of the Army, Navy, and Air Force.⁵ By 1943 normal public works had all but vanished from the department's programme. "The resources of the department as regards both men and material", said the annual report, "have been devoted to the prosecution of construction works required for the armed Services."⁶ Defence construction undertaken during the First World War had never amounted to



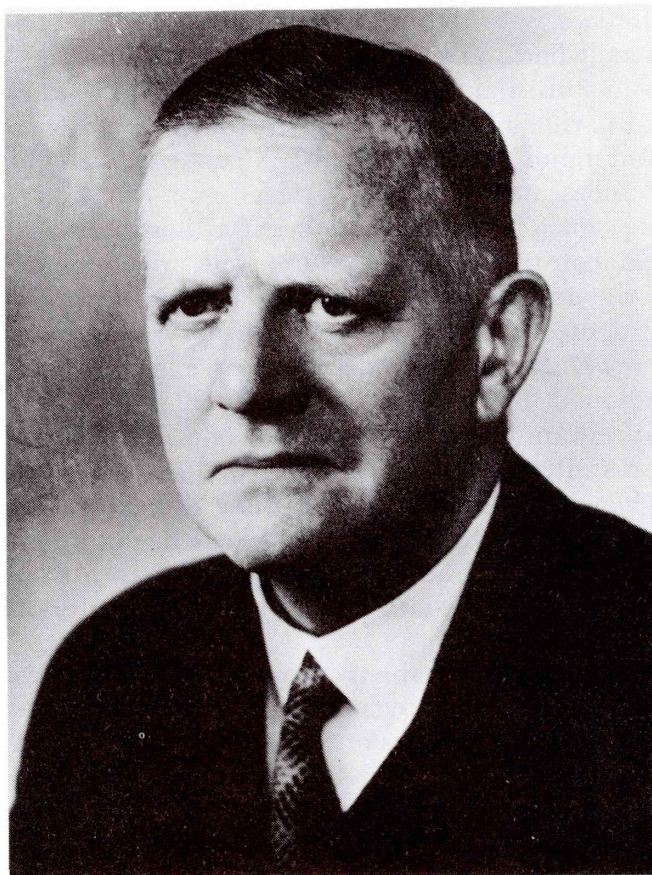
Hubert Thomas Armstrong (1875–1942), Minister of Public Works, January 1941 to November 1942. *Turnbull Library.*

anything like that. Between the two wars the department had acted as construction agent to the services as it had to other Government departments—in the twenties and early thirties this mainly involved the erection of stores buildings, magazines, drill halls, rifle ranges, and so on for the Army, as well as repairs, alterations, and renovations to existing structures.⁷ In the years immediately preceding the war the armed services and the Public Works Department had made plans for action in the event of hostilities and in some areas such as airfield construction they were well advanced by September 1939. Nevertheless the actual advent of war necessitated a building programme quite unprecedented in New Zealand's history. The total expenditure by the Public Works Department on defence works from 1 April 1939 to 3 March 1946 amounted to £47,466,202 (\$94,932,404).⁸ The problems involved in such a programme were also unprecedented. Semple (again Minister of Public Works after Armstrong's death in 1942) summed up the situation accurately when he pointed out that "The difficulties encountered in accomplishing such a huge programme would have been formidable enough under normal peace-time conditions. Under the stress and strain of war, with all its attendant shortages of staff, manpower, and materials these were at times almost insuperable."⁹

Shortages of staff and manpower occurred almost immediately as officers and employees began to volunteer for service overseas.¹⁰ The situation was further aggravated by the call of the armed forces on Public Works personnel to provide the basis of specialist engineering units for overseas*. Not only men but also departmental equipment was called up: altogether 555 items of plant valued at over £500,000 (\$1,000,000) had to be sent overseas;¹¹ and to add even further to the difficulties urgently needed imports of machinery and materials were frequently delayed or permanently lost because of the conditions in Europe and the Pacific.

It is obvious that in such circumstances only drastic measures enabled the defence programme to be fulfilled. During 1940 and 1941 normal public works were gradually curtailed as the demands of the defence departments increased. But as the likelihood of attack by Japan grew emergency powers seemed essential to ensure New Zealand's readiness. In March 1942 a Defence Construction Council was established, with the Prime Minister as chairman and including as council members the Ministers of Defence and Public Works, the commissioner of defence construction (vice-chairman), and the engineer-in-chief.¹² It was apparently Peter Fraser's idea. Early in 1942 he had toured the country's military camps and buildings and had discovered problems everywhere. He called in James Fletcher, a private contractor whom he was later to appoint Commissioner of Defence Construction, and told him something had to be done. "We can't go on like this. And, confidentially, there will be a host of American troops coming here before very long. We'll have to

*The Public Works Department participated as a department in the formation of the following units: Headquarters Group, Railway Survey and Construction Companies; 9th Railway Survey Company; 10th Railway Construction Company; 12th Railway Survey Company; 13th Railway Construction Company; 18th Army Troop Company; 19th Army Troop Company, and 21st Mechanical Equipment Company. (O.W.H./P.W.D., Vol. II, p. 351.)



Sir James Fletcher (1886–), Commissioner of Defence Construction, 1942 to 1943; Commissioner of Works, 1943 to December 1944. *Ministry of Works.*

accommodate them and, the way things are now, we can't even look after our own people."¹³ Building controls instituted at the beginning of the war had never been vigorously enforced and although public works had been curtailed in the interests of defence construction, the private sector had not been similarly restricted. According to J. V. T. Baker, in *War Economy*, during the first 2 years of war normal building remained at almost pre-war levels: "Private building was still using a large share of available resources and was at times being given priority by builders over defence work."¹⁴ The council immediately ordered a suspension of all non-essential construction work, whether state or private; called for a register of all building contracts and of all tradesmen employed in the building industry; reviewed defence works in progress and those proposed; and decreed an order of priorities to be followed.¹⁵ These and other emergency regulations effectively centralised control of manpower and materials and provided much needed co-ordination between the various parties involved in defence, private, and

public construction. The Government Architect, R. A. Patterson, on whose branch the wartime demands fell particularly heavily, was enthusiastic about the results obtained by these measures: "We have built to a scale never previously equalled and most certainly never contemplated as possible with the reduced manpower and restrictions in available materials . . ." ¹⁶ His summary of the measures evolved to cope with the circumstances gives a succinct picture of how such results were obtained:

- (a) Centralisation of administration, and co-ordination of requirements of the various fighting services in a directorate called the "Administrative Planning Committee", directly responsible to War Cabinet:
- (b) Centralisation of executive, and control of priorities, manpower, and materials required for the building industry through the Commissioner of Defence Construction, . . .:
- (c) Complete cessation of civil works, . . .:
- (d) Abandonment of competitive tendering, and adoption of a system whereby work is allocated to contracting organisations having the requisite man-power, experience, and administrative capacity for the class of work involved. . . .:
- (e) Total control of timber supplies. . . .:
- (f) The efficient manning of all works through Allocation Committees located in all the main centres. . . .:
- (g) Wherever possible, prefabricated demountable accommodation has been employed . . .: ¹⁷

Two of the most controversial aspects of this system were the suspension of competitive tendering for contracts and the appointment of James Fletcher as Commissioner of Defence Construction. Fletcher's powers were sweeping. He himself foresaw the possibility of endless conflict with Government departments who would resent his intrusion, with trade unions who might object to his methods, with private enterprise which was bound to oppose restrictions on its activities. ¹⁸ Among other powers invested in him by Order in Council, the commissioner could "give such directions as he thinks fit to any officers of the Public Service in relation to the exercise of any powers possessed by them, . . ." ¹⁹ Any orders issued by the commission were subject only to "any special direction to the contrary by the Prime Minister". ²⁰ Initially Fletcher had felt that the Public Works Department staff in particular would object to his appointment. ²¹ In fact as long as he remained commissioner for defence construction the Public Works Department co-operated wholeheartedly with his programme, apart from a few grumbles from Semple, who was always oversensitive about the position of his department, largely because he felt it reflected on his own importance. ²² What difficulties Fletcher had came largely from the armed services*. Within the department, the commissioner singled out R. A. Patterson, the Government Architect, as his main

*E. R. McKillop, during peacetime the Deputy Wellington City Engineer and stationed in the Pacific early in the war, was recalled to act as Fletcher's deputy with the specific duty of liaising with the services. When appointing him Fraser told him that Fletcher "was having a little difficulty in interpreting the demands of the Services, and getting into trouble through talking to the wrong persons, mixing up military ranks and creating a number of new ones all his own! Not that he was troubled—but the Services definitely were." (Robinson, N., *James Fletcher: Builder*, p. 139.)

aide and it was partly their close and productive relationship which ensured the success of the building programme. Fletcher either saw Patterson personally or talked with him on the telephone every day.

Patterson's role in the defence construction programme was in fact crucial. He was largely responsible for the scheme devised to replace competitive tendering for contracts. The peacetime system of contracting simply could not cope with the unprecedented demands of wartime construction. Frequently plans and specifications could not be prepared in advance for urgent works and contractors were reluctant to tender fixed prices with the constant fluctuations in the availability and therefore cost of labour and materials. Apart from everything else there was considerable delay in having several contractors price the same job, prepare tenders, submit them to the Tenders Board which in turn had to refer its recommendations to the Minister for approval. The cost plus percentage and cost plus fixed fee systems were alternatives to competitive tendering widely used during the war in Great Britain, Australia, and the United States.²³ But these had serious disadvantages. In the case of percentage payment the greater the cost of the work the more lucrative the profit—hardly an incentive to efficiency and economy. Moreover it required an enormous administrative staff to check innumerable invoices, wage sheets, and other evidence of costs*. With “cost plus fixed fee” some of the less desirable features of the percentage system were avoided. But the fixed fee was based on the estimated cost of the work and therefore was only applicable where such costs could be accurately assessed—which was impractical with most of the more urgent defence projects. By the middle of 1941 Patterson had recognised that there were problems ahead for the defence construction programme if traditional methods were adhered to. In October 1941 he warned the head of the department that contractors were becoming more and more unwilling to incur the risks involved under the usual process of tendering and he suggested that a central committee be set up with powers to allocate labour and contracts.²⁴ Although the idea was considered by the executive officers of the Public Works Department no action was recommended and in the following months the situation continued to deteriorate. Finally in March 1942, at the first meeting of the Defence Construction Council, the commissioner and the Government architect were directed to devise a scheme to permit—

- (a) Having a fixed price for all contracts;
- (b) Work being started prior to the contracts being finalised;
- (c) A schedule being furnished showing the cost of materials, labour, overhead, and profit;
- (d) An organisation being set up under the Government architect for the preparation of all bills of quantities for contracts on a standard basis.²⁵

*The *Official War History* of the department notes that early in the war a new military camp at Papakura had been erected on a “cost-plus” basis and “although a huge staff was transferred to the site, it was found that the checking of accounts and the general supervision necessary to control the expenditure imposed an intolerable burden on the Department's officers.” (O.W.H./P.W.D., Vol. I, p. 185.)

This resulted in the master schedule system. Under the system "the proposed work was divided into its component parts, and an initial contract price arrived at by multiplying such component parts by the unit prices (labour and material) allowed in the master schedule. To the initial contract price were added extras allowed in respect of country work and other appropriate adjustments, plus 5 percent profit and $2\frac{1}{2}$ percent overhead, thus making up the final contract price."²⁶ The system began to operate on 8 April 1942. Initially the Government architect allocated contracts until a central allocation committee could be established. Once allocated master schedule contracts were administered in their entirety by the Public Works Department, but as the system entailed the extensive use of quantity surveyors, both in compiling the master schedules and in arriving at the contract prices, the services of four quantity surveying firms in private practice were engaged.

Like the other emergency systems designed to cope with wartime conditions the master schedule had its share of weaknesses, not least of which was the inability of the quantity surveyors to handle the amount of work to be undertaken. A year after its inception a report on how it was working summarised several problems:

1. Confusion through instructions, often conflicting, emanating from different sources. (If complete control from inception to the final certificate were entirely in the hands of the Government architect, "the worst troubles would disappear".)
2. Unsatisfactorily constitution of the local allocation committees. (The meeting suggested that such committees should comprise (a) a representative of the Public Works Department, (b) a representative of the builders, and (c) a disinterested third party, possibly a private architect.)
3. Inefficiency amongst builders.
4. Inefficient clerks of works.
5. Works starting without the knowledge of Public Works Department district officers. (It was alleged that local allocation committees often commenced works without proper authority.)
6. Incomplete contract documents, i.e., insufficient information on plans and specifications; plans without specifications; and lack of details.
7. Field officers were not kept posted with up-to-date information and instructions.
8. Completion of works was delayed (a) on account of lack of materials, and (b) through negligence of the contractor, sometimes in his haste to secure a new contract.
9. Contractors ignored instructions and carried out work in a slovenly manner.
10. Excessive alterations, many unnecessary, were authorised after the contract was let (this, stated the report, took a lot of time in adjusting).

11. The addition of buildings to a contract after it was let.
12. The functions of the clerks of works should be defined in writing.
13. Decisions of men in the field should be supported by higher authority.
14. Many clerks of works, builders, and engineers were unfamiliar with the fundamentals of (a) standard building practice, (b) law of contract, (c) sundry rules and regulations—or, if familiar, deliberately ignored same.
15. Services and roads were often carried out after the buildings had been erected, with unsatisfactory results as to levels, layout, etc.
16. There was still uncertainty as to what rates to apply, and lack of uniformity in applying the rates.²⁷

The contractors too had their own criticisms of the system. By August 1942 some were seriously embarrassed by the delay in finalising accounts for defence contracts. The hold ups occurred unavoidably in the offices of the quantity surveyors. As the *Official War History* comments the very fact of dispensing with the formalities which usually took place *before* a work commenced led to an unavoidable delay *after* its completion.²⁸

But the most serious criticism of the master schedule system developed over profits made by the contractors. A report made by the assistant under-secretary of the Public Works Department at the request of the commissioner of defence construction found that profits made by contractors were from 15–20 percent higher than allowed for under the master schedule.²⁹ This report was made in September 1942 and followed by immediate modifications to the scheme. But further investigations submitted a year later showed that the profit and overhead on individual contracts fluctuated from 3 percent to as high as 72 percent—in the Christchurch district the lowest figure was 15.75 percent. The overall average profit was considerably in excess of the 7.625 percent allowed.³⁰ Various inquiries ensued and innumerable conferences were held with the builders and contractors.³¹ Ultimately a contracts adjustment commission was set up to review the position of each contractor involved in defence work. It first met in February 1944 but was forced to adjourn indefinitely when in August the Master Builder's Federation refused to continue participating. The commission was formally abandoned a year later.³²

From mid 1943 limitations were gradually placed on use of the master schedule system and it was finally phased out in July 1944 when competitive tendering was reintroduced.

With all its drawbacks the master schedule system undoubtedly enabled the New Zealand Government to cope with the huge volume of defence works better than any other system which up to then had been devised. During a period when building costs in Britain rose by 100 percent, in New Zealand the rise was under 25 percent.³³ The district engineer at Auckland in a

memorandum on the system pointed out the importance of the master schedule in the economy as a whole:

"Although it cannot be denied that the master schedule was far from perfect in that it was compiled hurriedly and during a time of flux when it was difficult to fix prices, nevertheless it can be claimed that this method did a wonderful job in controlling and stabilising the cost of building. Not only that but because building has been the major industry during the war period it has had a steadying influence on prices generally. I believe that to a large extent the comparatively healthy conditions existing in New Zealand today are due to the master schedule. . . ." ³⁴

The Commissioner of Works maintained that "an examination will prove that if the master schedule had been properly applied and the rates checked with actual costs kept on the works, the results must have proved to be more satisfactory than under any other system with which it could be compared". ³⁵ He laid part of the blame for its misapplication on the "lack of appreciation by certain of the district engineers and their staffs of their responsibilities under the system", but in doing so he recognised the difficulties with which departmental officers had to contend.

The most serious of these difficulties was shortage of staff. The table reproduced on p. 200 shows the declining proportion of staff to expenditure. As the *Official War History* noted the Public Works Department was faced, on the one hand, with the largest construction programme in its history and, on the other, with a constant drain on its staff as each year more and more officers joined the armed forces. ³⁶ Altogether 1,336 staff members served overseas in the services. There was a comparable decline in the amount of labour available to the department. To cope with this shortage, Public Works employees, like all others in the construction industry, came under the Defence Works Labour Legislation Suspension Order 1942, colloquially known as the "Fletcher Order affecting labour" ³⁷ because it was drawn up by the defence construction commissioner. There were five principal provisions:

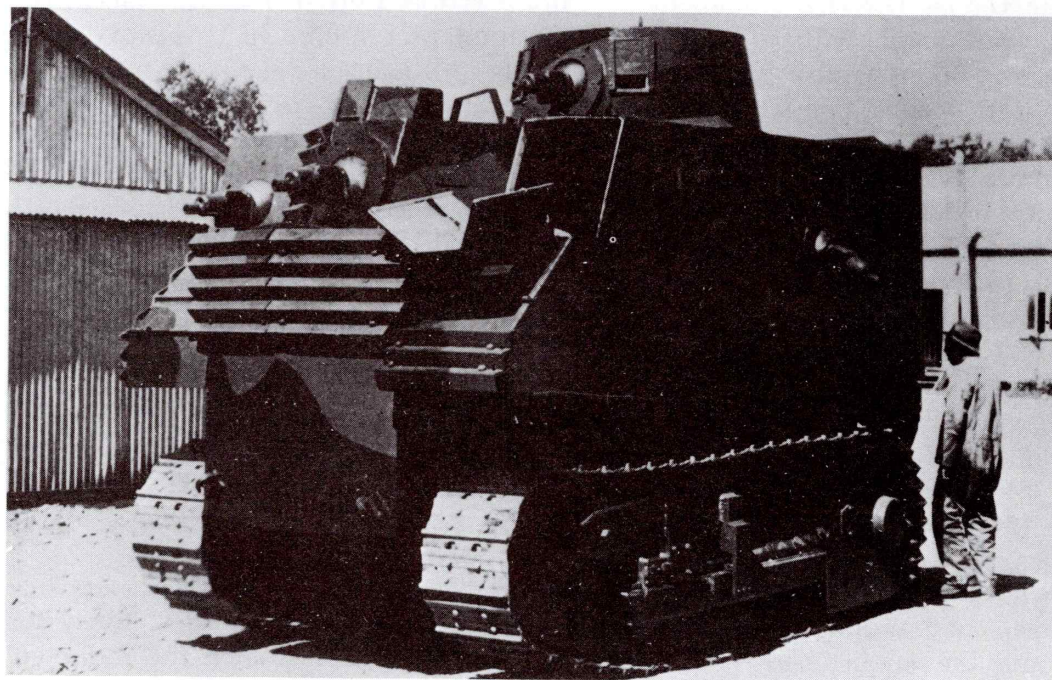
- (1) The institution of a 54-hour week—9 hours per day for 6 days of the week.
- (2) Payment of hourly wages as set out in the order.
- (3) The elimination of overtime for work on Sundays or holidays.
- (4) Payment of a minimum wage of £5.5.0 (\$10.50) per week.
- (5) Payment of an allowance of 30s. (\$3) per week on country work, unless board and lodgings were provided by the employer, . . . ³⁸

Not only the trade unions but also senior officers of the Public Works Department had serious misgivings about certain aspects of the order. Early in June the engineer-in-chief discussed with the commissioner the value of the long hours of work and at the end of the month he argued for a reduction because of the shorter hours of daylight during winter; and more importantly

because workmen, especially those doing really hard work out in the open, were “cracking up” under the strain of the 54-hour week. The consensus of opinion among his officers, he said, was that as much work—if not more—could be accomplished under a 48-hour week.³⁹ As a result of these representations the regulations were altered at the beginning of July.

Emergency measures to get the most out of the manpower available were matched by ingenious improvisation to supplement depleted stocks of machinery and equipment. One of the most spectacular but also least profitable ventures was the department’s attempt at armoured-tank building. The New Zealanders’ alleged flair for improvisation was exploited to the full by the department during the war. The conversion of a tractor into a military tank was one of its end results.

In June 1940 Semple received a letter from an H. W. Bish who had served in the Royal Tank Corps in France during World War I suggesting that turrets and guns be made, to be readily fitted in an emergency to tractors owned by the Public Works Department.⁴⁰ By that time, however, construction of a tractor-tank was already well under way in the department’s Temuka workshops, apparently the result of a suggestion from the District Engineer, T. G. Beck, enthusiastically endorsed by his Minister. A trial



The “Semple” tank. One of the department’s tractors adapted to serve as an armoured fighting vehicle. *Ministry of Works*.

demonstration was in fact held only a few weeks after receipt of Bish's letter, witnessed by the Prime Minister, the Minister of Defence, Semple, and one or two departmental officials. Semple's fondness for this particular project had clearly enthused his Cabinet colleagues. Initial reports were optimistic: "appearance and manoeuvrability were considered very satisfactory, also the fire power" but a new gearbox was deemed essential to "raise the maximum speed to about 15 miles per hour".⁴¹ There was some disagreement over how much of the tractor was to be covered with the new corrugated type of armour that was finally chosen as the most effective shield. The engineer-in-chief proposed to cover the whole tank, top and sides. Beck pointed out that this would add very considerably to its weight. The Army considered anti-tank armour need only be fitted over the vital places—around the driver and around the gunners.⁴²

It was decided that 81 D8 tractors owned by the department would be candidates for conversion at \$4,200 per machine. By February 1941 two more had been converted and during March and April they were proudly displayed at various parades and exhibitions. Such appearances were not without their problems. In instructions to the Auckland district engineer on one such occasion the engineer-in-chief wrote:

"In changing gears on D8 tractors, the machine will momentarily come to a standstill during the change unless a rolling change is made whilst the machine is running down grade, and therefore it is desirable that the driver be instructed to select a gear which will carry the machine on for periods as long as possible during the procession. Third gear will probably suit for the easier part of Queen Street for instance with one change down to say first when the steep grade into Wellesley Street or Upper Queen Street occurs . . . I wish to stress is that as little gear changing as possible should occur so that the public will not get the impression that stalling of the machine has occurred along the route."⁴³

Even in wartime one had to be mindful of one's public relations. A total of three tractors were converted, then in mid 1941 the Minister of Defence notified his colleague in Public Works that no more would be necessary "in the meantime".⁴⁴ The three tanks were formally taken over by the Army in December⁴⁵, but exactly a year later the Army was negotiating their return to the Public Works Department. Apart from testing and training runs they had little use and despite the enthusiasm of their creators there was considerable doubt as to their ultimate utility. Major-General Puttick summarised the disadvantages of adapting a commercial vehicle for such a purpose as "excessive size (particularly height), low speed, and vibration. The weight of the machine, namely, 25 tons, was too great for certain bridges, and thus limited its employment, . . ."⁴⁶ But their originators intended them as stop-gaps, not as substitutes.

Beck and the Christchurch workshops also pioneered a concrete machine-gun post which like the tanks never had to be used because New Zealand was never invaded. But it would certainly have proved more practical than the erstwhile tractors. A report in the *Star-Sun* described the post as "Cylindrical in shape, it is made in sections of pre-shrunk concrete which is spun and steam-cured, giving it a durability which is not obtained in ordinary box concrete".⁴⁷ The sections had the advantage of being almost identical to those then used by the department in the construction of culverts so if their military function turned out to be unnecessary they could be re-employed on public works.

Such improvisation and inventiveness characterised much of the emergency construction undertaken in the early years of the war and without it some projects would never have been completed quickly enough. That the large camps built for the United States forces in the Paekakariki area were completed on time was entirely due to two factors—the use of standardisation and prefabrication, both techniques well applied by the Architectural Branch. In the case of the Paekakariki camps the Government architect

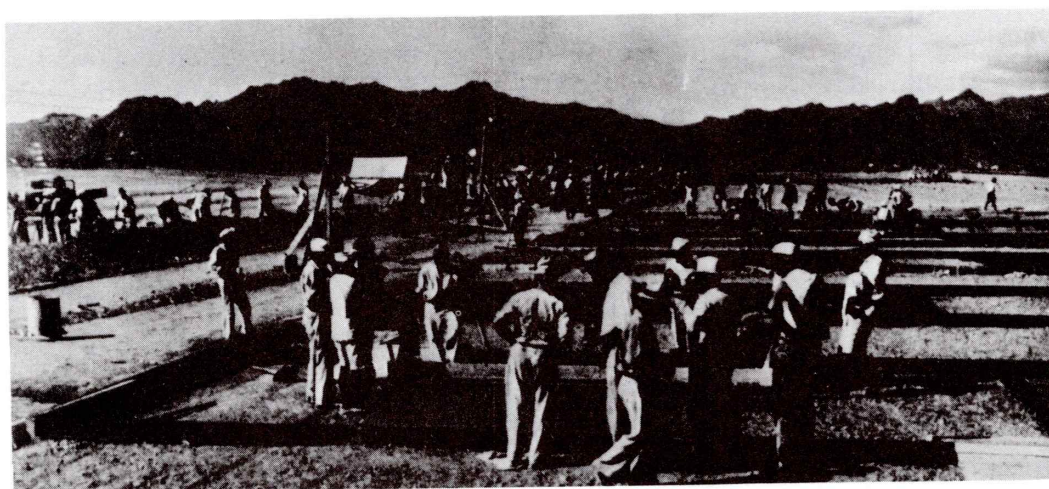


One of the camps near Paekakariki erected for the American armed forces. *Ministry of Works.*

was given only 6 weeks' notice to provide accommodation for 20,000 men. The sites that had been selected were little more than empty paddocks on which sheep were grazing. To their surprise the Americans found on arrival three complete camps with hot and cold water laid on, drainage installed, and cooking facilities all ready for use. The buildings had been prefabricated in the South Island, marked, numbered, and shipped to the north where they were simply assembled by groups of North Island contractors.

Another extremely rapid construction job organised by the Public Works Department involved the extensions to Nandi Airport requested by the United States Government once Japan had attacked Pearl Harbour. The work consisted of three runways with a minimum length of 7,000 ft and a width of 500 ft.⁴⁸ This involved shifting 1 million cubic yards of spoil and the runways alone, which were to be concreted, required 20,000 tons of cement. As well there were buildings to be constructed and servicing areas prepared. The first of the runways had to be ready by 15 January 1942, the other two, by 3 months later. The request was made on 14 November 1941.

To get the work done the Public Works Department organised the Civil Construction Unit with staff and men equivalent to what would have been employed in a major New Zealand public works district. Everyone was provided from district engineer down to message boy. By the end of November 440 men of the unit had reached Fiji. They were the first of 1,219 who worked on the project. With them went 377 items of departmental plant valued at \$610,000. These included 29 compressors, 28 concrete mixers, 14 carryall scrapers, 49 tractors, and 100 motor trucks. Equipment was promised from the United States but it never arrived; instead the goldmines of Fiji were



The Civil Construction Unit concreting a runway at Nandi, Fiji. *OWH/ASB.*

raided for trucks and conveyors were supplied from the sugar mill at Lautoka.⁴⁹ But most of the machinery came from New Zealand. Just building a temporary accommodation camp and work base for the unit and the 900 Fijians employed on job was a huge undertaking. But when the first three Flying Fortresses landed at Nandi on 10 January, 5 days ahead of schedule, the runway and auxiliary services were ready for them. The estimated cost was \$1,500,000 (repayable by the United States) and a senior American officer told the district chief clerk and accountant that the unit had done an excellent job at about half the cost the Americans could have done it themselves.

Not all the aerodrome construction projects had such happy endings. The history of the Ardmore airfield illustrates some of the pitfalls which could accompany hurried decisions made in emergency circumstances. Ardmore was a fighter strip built at the request of the United States forces for the defence of Auckland when Japanese invasion seemed imminent.⁵⁰ The "Official War History of the Aerodrome Services Branch" recounts that in March 1942 the Air Force gave urgent instructions to the Public Works Department to survey and lay out two runway strips in the Ardmore district near Papakura. The two were to have minimum lengths of 1,500 yards and were to be 500 ft wide. They had to be ready in 9 weeks. The Public Works Department demurred. The department was already taxed to the limit of its capacity with aerodrome extensions and the concreting of runways at Whenuapai and Ohakea, besides Nandi and other jobs in the Pacific. There was neither plant nor personnel to carry out the work at Ardmore. Apart from that, the department objected to laying runways in the district without careful investigations because of the preponderance of soft peat. The objections were overridden and the department ordered to proceed. It had scarcely started when a United States Naval – Air Force base to accommodate 2,500 men was added to requirements on the site. This included barracks, officers quarters, messes, recreational facilities, hospital, laundry, boiler house, garages, and workshops, as well as the workshops and hangars on the aerodrome itself. Work on it was started immediately. When it was half completed the Americans advised that they would not need it. After modification it was taken over by the RNZAF in 1944 as a fighter training base. Within a few months the runways—intended only for light planes—began to show signs of breaking up*. By the end of the year one of them was unusable and the old surface had to be torn up and replaced by a 7 in. base course followed by 3 in. of cement-stabilised paving.

The Pacific Islands to the north of New Zealand were regarded as the country's first line of defence. The Public Works Department as a whole and the Aerodrome Services Branch in particular were deeply involved with defence construction throughout the area. The department not only

*Training actually began with Kittyhawks but these were replaced by Corsairs of approximately double the weight and having high-pressure tyres and higher landing and take-off speeds.

built aerodromes, seadromes, and radio stations on the islands but it also sent out survey parties and coastwatching expeditions, calibrated direction-finding stations, and prepared maps and charts. In the late thirties an engineer from the Aerodrome Branch had made a survey of the Pacific which formed the basis for subsequent work there.⁵¹ His report provided not only essential technical information but interesting observations on life and attitudes in the islands. Of one place he commented that: "Local ideas centre round paddocks about big enough for Moths to operate in and it is hard to make their ideas run past that."⁵² His general conclusion was that: "Living in exalted state among native communities these white men had developed curious conceptions of their own invulnerability."⁵³ Based on this verdict the department realised that it would have to depend entirely on its own resources and use its own judgment for any work it did in the Pacific.

For department personnel posted to uninhabited islands life varied from devastatingly monotonous to dangerously exciting. In October 1940 a party of two, for example, were deposited on Suvarov Island—the coral atoll barely justified such a designation. They were to survey the area as a potential seaplane stopover. Just below the equator and only a few feet above sea level Suvarov was a hot, humid uncomfortable spot—and as the party discovered doubly so during the hurricane season. Two months after they arrived a hurricane not only washed away their stores and boat but also changed the topography of the atoll considerably. The survey work already undertaken had to be scrapped. It was 4 months before they were relieved—somewhat the worse for their stay. The second party fared no better. A hurricane destroyed practically all the coconut trees, removed whole islands from the lagoon, and covered the entire area in sea for 10 hours. The party were lucky to escape alive. All their stores and equipment were lost and they were without radio communication for over a month. When they were eventually picked up the leader of the party had to borrow a pair of trousers before boarding the boat to return to New Zealand. No more Public Works Department personnel were sent there.⁵⁴

By 1944 the department's annual statement could report that: "So far as constructional activities for defence requirements are concerned, we have now passed the peak period, and whilst there is still a number of defence works to be carried out, these are confined to relatively minor items of a more permanent nature."⁵⁵ The new priority was for urgently needed civil projects postponed by the war. The basic problem was how to convert the economy back to a peacetime basis without seriously disrupting it. Steps had in fact been taken as early as 1943 to prepare for the postwar period. In July 1943 a Bill was passed by the House which created a Ministry of Works to "establish more appropriate control over the execution of all construction works, including housing construction, . . ."⁵⁶

The idea apparently originated from discussions among the senior officers of the Defence Construction Council. (See p. 165.)⁵⁷ James Fletcher's concept, as it was presented to the Cabinet, involved a small group of experts—engineers, architects, representatives of Treasury, and other Government departments. Its task would be “to study every major proposal that other departments were considering, examine it objectively in relation to other calls on Government finance, and establish its priority. The Ministry would also decide whether buildings would be designed by Government or private architects and who would build them: the Public Works Department or private firms, by negotiated contract or by tender.”⁵⁸ The functions of the Ministry of Works as set up by the 1943 Act were set out in a memorandum, dated 4 August, from the engineer-in-chief to his senior officers:

1. In association with Treasury to ensure that all schemes for construction involving expenditure of Government funds are thoroughly examined independently of the source from which they originate, both from an economic and a technical point of view. In this connection not only will proposals coming through Government departments be examined, but also the proposals of local bodies or private interests where such carry with them Government subsidies.
2. To ensure that during the war period and the immediate post-war rehabilitation era all proposals for construction (whether or not these involve the direct expenditure of Government moneys or carry Government subsidies) are ranked in order of essentiality from the point of view of manpower and materials available. In other words, to ensure that the whole of the building and construction potential of the country is assembled and utilised in the most efficient manner.
3. To ensure that projects approved for consideration involving the direct expenditure of Government moneys or Government subsidy are executed efficiently and economically whether such works be carried out by the Government itself or by the subsidised authority.
4. To ensure that no work is undertaken in conflict with the national interests, or, in other words, to relate proposals for consideration to an established national plan.
5. To assume the responsibility for the execution of the defence construction programme previously vested in the Defence Construction Council.
6. To carry out the responsibilities previously vested in the Ministry of Public Works and the Ministry of Housing.⁵⁹

The specific tasks of the Commissioner of Works were also defined:

- (a) To make or arrange for a thorough investigation from the general economic, engineering, architectural, and other relevant aspects of all proposed schemes of construction involving expenditure of State funds for which the Minister of Works is responsible, and in respect

of such other proposals as may be required from time to time. Reports on all such investigations shall be made to the Minister and through the Minister to Treasury.

- (b) To organise and promote the undertaking of all construction work approved by Cabinet and to co-ordinate the functions and activities of State departments, and where necessary, of other bodies in carrying approved schemes into effect.
- (c) To recommend the order of urgency in which approved works, whether State, local authority, or private, should be carried out, having regard to the available resources of manpower and material from time to time.
- (d) To review the supply of materials and plant from time to time and to make recommendations to the Minister as to any action that should be taken to augment the supply of any particular types of plant or material, and
- (e) Generally to assist and advise the Minister of Works.⁶⁰

Finally the relationship of the Public Works Department to the new ministry was defined:

"... the position is that in the planning, investigation, establishment of priorities or inauguration of work, or on matters concerning policy changes, the Minister's directions to the Department will be given through the Commissioner of Works who, in this respect, will be vested with the Minister's full authority.

Instructions coming through the Commissioner in the above manner will be transmitted by him to the Permanent Head of the Department, and all instructions to officers of the Department will be issued by the Permanent Head through the various controlling officers.

Instructions concerning the routine operations of the Department, apart from the above, and with which the Commissioner is not concerned, will go directly as at present from the Minister to the Department.

Once the Commissioner has inaugurated any project, and has satisfied himself that the arrangements made with the Department for carrying out the work, particularly in regard to the supply of plant, labour and material, are satisfactory, responsibility for carrying out the work and for its successful completion will lie with the Permanent Head of the Department."⁶¹

Fletcher accepted the appointment of Commissioner of Works but he had some misgivings about it. After a period of being responsible only to the Prime Minister he was now to work under Robert Semple. Relations between the two had never been smooth and the Commissioner doubted that Semple would allow him the freedom of action he had enjoyed under Fraser. He further feared the reactions of Public Works Department staff to his appointment to the Works post and he later maintained that in fact many senior

engineers were angered and that Semple did nothing to allay their doubts.⁶² Both the engineers' and Semple's attitude stemmed, Fletcher believed, from a fear that not only his appointment but the whole concept of the Ministry of Works threatened their own authority. If this was the case then their fears were shortlived, for the merging of the Public Works Department and the ministry a few years later marked in fact the absorption of the ministry by the Public Works Department and the confirmation of the primacy of the engineer.

The public works priorities of the immediate post-war period were quite different from those of the previous 70 years and it was soon apparent that a drastic reorganisation of the Public Works Department was needed to cope with the new demands. The department's organisation had been devised to handle primarily road and railway construction. By the mid forties it was clear that housing and other building—for example hospital and schools—and hydro-electric as well as highway development would be its major activities, at least for the immediate future.

The establishment of the Ministry of Works itself had involved some reorganisation of the Public Works Department, the most obvious aspect being the incorporation of the Housing Department into the Public Works Department. In May 1943 Semple advised the engineer-in-chief that he was setting up a departmental committee of the department's principal officers⁶³ to prepare recommendations regarding the general reorganisation of the department.

The terms of reference were very broad. They required a review not only of the position of the Housing Construction Department but also the Hydro-electric Branch with a view to establishing the latter as a separate department. Methods of costing public works construction were to be examined as were methods of constructing State financed or subsidised works. Finally the administration of the department was to be comprehensively reviewed.⁶⁴ It was this area of operations which was to necessitate the greatest changes. While organisational changes involving the entire department were being considered Semple directed that the Public Works and Housing Construction Departments continue to operate under separate control.⁶⁵ This departmental committee was only the beginning of a long drawn out debate between the Government, the Ministry of Works, the Public Service Commission, the Public Works Department, and other interested Government departments, on how best the Public Works Department could be reorganised. It was not until April 1945 that any final decisions were announced, reorganisation was effective only from the end of that year, and there were some considerable modifications made in the years immediately following.

Some initial delay was caused by the continuing wartime situation and it was not until 1944 that the Ministry of Works turned its full attention to

civil requirements including the reorganisation of the Public Works Department. There was never much doubt that the Hydro-electric Branch would be separated from Public Works. As the Commissioner of Works emphasised in a letter to Semple "it had become virtually a trading organisation with little connection to a department whose primary purpose was one of construction".⁶⁶ Original proposals were for the new department to undertake as well as the generation and supply of electricity, the planning and design of hydro projects, actual construction to be carried out by the Public Works Department. In practice the division between design and construction proved unsatisfactory and from April 1948 the Public Works Department resumed the investigation and design of civil engineering works*.

The absorption of the Housing Construction Department proved far more complicated than the separation of the Hydro-electric Branch. At one stage the decision to amalgamate the two was reviewed by the Ministry of Works because: "Some doubt was expressed as to whether the greatest degree of efficiency would be achieved by the departments being actually amalgamated . . ."⁶⁷ The Public Service Commissioner argued that the departments should remain separate with Public Works simply carrying out services and all major engineering works for the Housing Department.⁶⁸ The final decision however was for merger and in February 1945 the Commissioner of Works announced the details of a major reorganisation of the Public Works Department which included the establishment of the Housing Construction Department as one of four divisions of the Public Works Department.⁶⁹

The major features of the reorganisation were summarised in a memorandum from the Commissioner of Works to the Permanent Head of the Public Works Department and the Director of Housing Construction:

- (a) That the Public Works Department should be divided into four main divisions—
 1. Engineering—under the engineer-in-chief.
 2. Architectural—under the Government architect.
 3. Housing—under the director of housing construction.
 4. Administrative—under the under-secretary.

While the Commissioner of Works will have an overriding control over all four divisions, each of the divisional officers will be responsible to the Minister through the Commissioner of Works for the execution of all works which fall within the province of his particular division. He will also deal direct with the Public Service Commissioner on matters of staff.

The engineer-in-chief will continue as Permanent Head of the department, and will function in any matters not coming within the scope of the above definition.

*The Hydro-electric Branch had always handled design and installation of the mechanical and electrical equipment, and this work went to and remained with the new department.

- (b) It is proposed that the Hydro-electric Branch of the Public Works Department should be reconstituted as a separate department of State under direct ministerial jurisdiction but that the constructional activities of the reconstituted department, as distinct from the generation, distribution and sale of power, should remain within the structure of the Ministry of Works as a separate division. Pending complete severance from the Public Works Department the Hydro-electric Branch will operate as a separate division of the Public Works Department with the same measure of independence as applies to the other divisions.
- (c) That as indicated above, the Housing Construction Branch, originally attached to the State Advances Corporation, should form a division of the Public Works Department.
- (d) That territorially the Public Works Department should be reconstituted by a reduction in the number of districts to 6 only, those suggested being—
 - A. Auckland—involving the division of the Auckland District as presently defined and taking in the whole of Whangarei district, located at Auckland.
 - B. Waikato—taking in the balance of the Auckland district and the whole of the Taumarunui and Tauranga districts, located at Hamilton.
 - C. Hawke's Bay—taking in the whole of the Napier and Gisborne districts, located at Napier. (For the Housing Division there will be no district office at Napier but one at Palmerston North, and some adjustment in the boundaries of the District will thus be necessary).
 - D. Wellington—taking in the whole of Wellington, Wanganui and Nelson districts, located at Wellington.
 - E. Canterbury—taking in the whole of Christchurch and Greymouth districts, located at Christchurch.
 - F. Otago—taking in the whole of the Dunedin district and Southland, located at Dunedin.
- (e) That in lieu of the existing system of appointing inspecting engineers to control defined geographical areas, the general inspection should be undertaken by each of the district engineers in the reconstructed larger district areas, and that the control from Head Office should largely be on a functional basis by the appointment of engineers who are specialised in each of the major functions of the department's work. Similarly this is to apply to architectural, housing and non-technical administration coming within the province of the under-secretary.

It should be mentioned here that in regard to the Architectural Division, provision is made for the setting up of district representation in three districts only in New Zealand—

A. Auckland and Waikato with headquarters at Auckland.

B. Wellington and Hawke's Bay with headquarters at Wellington.

C. Canterbury and Otago with headquarters at Christchurch.⁷⁰

The Permanent Head in advising his officers of the proposed changes argued that the need for them arose out of the growth of the department and the necessity for "very considerable decentralisation of authority as well as of control . . ." ⁷¹

Of all the difficulties surrounding implementation of such sweeping changes, one of the most difficult and possibly most delicate was the reallocation of authority at district level between the district engineer and the other divisional representatives. E. R. McKillop, who succeeded Fletcher as Commissioner of Works, recognised this fact and went to some lengths to define the relationships between the district officers:



Edgar Ravenswood McKillop (1895–), Commissioner of Works, January 1945 to March 1955. *Ministry of Works*.

"The District Engineer should remain the controlling officer in each district, but his controlling authority should be confined to matters which are not clearly sectional in character. In any emergency, or where it is necessary for someone to exercise an overriding authority that authority should remain vested in the District Engineer. If, however, as a result of any decision made by the District Committee or by the District Engineer any divisional officer feels he is adversely affected he should have recourse to his divisional head in Wellington, but it is hoped that such action will very seldom be necessary.

From a broad point of view, and to make the picture clearer, I should say the Department's administration remains, from an operating point of view, much the same as in the past, except that within each particular division as much responsibility as possible is to be centred in the divisional heads and through them directly to their representatives in each district. The District Engineer's technical responsibilities should be confined to the work of his division although his decision on questions of general administration is to be taken subject, as indicated above, to the right of reference in particular cases to the divisional head in Wellington."⁷²

District Committees were set up to implement the recommendations and ensure smooth changeover in each area. Staff shortages and other problems precluded any rapid reorganisation but in October a letter went out to all Public Works Department officers instructing that as from December 1945 "the divisional officers appointed to the respective six major districts will assume their responsibilities."⁷³

The reorganisation however was far from final by that date. In October 1947 a new district centred on Wanganui was created.⁷⁴ It involved the breaking up of the Wellington district which as originally constituted was approximately half as big again as any other district. The reduction in the number of districts from the original 12 to 7 aroused considerable public interest particularly in those areas which felt they had been demoted from full district status. Whangarei's *Northern Advocate*,⁷⁵ Nelson's *Evening Mail*,⁷⁶ and Gisborne's *Herald*⁷⁷ all reported some dissatisfaction at the new arrangements. The *Evening Mail* argued that a more logical division for the northern part of the South Island would have been a district embracing all the territory north of the Canterbury Public Works district. And it noted that "There is always a tendency for services rendered to be in inverse ratio to the distance from the place where decisions or recommendations are made." The *Gisborne Herald* quoted the local Chamber of Commerce as believing that without a district centred on Gisborne: "We are getting more neglected than ever before". As late as October 1950 Gisbornites were still bemoaning their lack of a local district office. In a speech to the House the member of Parliament for Gisborne regretted the very limited powers of the local

resident engineer, and spoke of Gisborne resentment at being a subdistrict of Napier. In an effort to avoid aggravating ill feeling between the Napier and Gisborne offices the Gisborne engineer wrote immediately to his superior at Napier emphasising that the member of Parliament's information had not been obtained from him. He commented that rivalry between the two areas had existed for many years and was not limited to the Public Works Department offices. He concluded that "In view of the very happy relations which exist between you and me and the very liberal arrangements you have permitted in correspondence, etc., with Head Office . . . I can only deplore the fact that I and my department have had to be singled out and lampooned to provide subject matter for a political speech."⁷⁸

Despite the views of the resident engineer it does seem that there was some initial resistance to the reorganisation from Gisborne Public Works personnel. The district chief clerk based in Napier wrote to the under-secretary in May 1947:

" . . . I do not know whether other districts have had the same experience, but I feel that there is some antipathy on the part of constituent districts to district control and that their co-operation in the system is not as sincere as it might be. I have recently had to make a written complaint to the Gisborne Office about their conduct of correspondence following repeated verbal complaints."

He was however optimistic that the situation would improve: "any natural antipathy to the change will die as the younger officers come forward."⁷⁹ Others disagreed. The chief accountant condemned the new system in no uncertain terms:

"Zone control was introduced after the War (1st December last to be correct), and I now ask the question what has this achieved? I venture to say that 75% of the Senior Staff of the Department if they were asked for their opinions would say nothing but confusion and results emanating therefrom.

The Public Works organisation, unlike the Public Trust Office, does not lend itself to a policy of decentralisation. For Administrative policy the Public Trustee looks to the Will of a deceased person, or, in the case of an intestacy, to the Administration Act and such powers can and are delegated to District Public Trustees, but the administration of a State Department expending public moneys on works and services, is so centred on Ministerial and Cabinet control, that I fail to see exactly what powers of any importance can be so delegated.

Is it not absurd to think in the present age of progress that a reply on a policy matter from say Westport has first to go to Greymouth, then to Christchurch, and finally to Head Office. Records and staff to deal with same have to be maintained at each of these offices and I have heard it said that a reply can be obtained quicker from England than from Westport to Head Office

or vice versa. I would estimate that at the end of each year the Department would be able to fill a truck with duplicate, triplicate and useless copies of correspondence throughout the Dominion.”⁸⁰

Basically the chief accountant was concerned with costs and efficiency. The Public Service Commissioner although accepting the district scheme suggested to the Commissioner of Works that after a year in operation some adjustments were essential. In passing on his comments McKillop asked the under-secretary to investigate the situation:

“It appears essential that the administrative authority of the District Engineer should be strengthened in the district, and you should consider whether it is possible for your District Chief Clerk to function separately from the District Engineer while this officer is charged with the full responsibility of administration of the district. It is further suggested that the channels of communication from outlying districts to Head Office have become complicated and the right of direct approach to Head Office should be given to two or three of the smaller districts now operating as Resident Offices.”⁸¹ The chief accountant was apparently correct in his complaint about administrative costs within the department because McKillop added that they were unduly high and that a complete review should be made of the staffing situation. There seemed to be some conflict inherent in the suggestions on the one hand that the district engineer’s authority be strengthened, on the other that increased decentralisation be allowed. The district chief clerk noting this apparent contradiction argued against correspondence going direct to resident offices, on the grounds that this would serve to further reduce the status of the district offices,⁸² and, although he did not say as much, his own authority.

The extent of the district engineer’s authority was even more uncertain *vis-à-vis* the local district architect. The problem of relations between engineer and architect was not a new one, indeed it has vexed Government architects throughout the century. John Mair raised the issue in 1940 when he objected to material prepared for the New Zealand centennial celebrations, stating that the Architectural Branch came under the engineer-in-chief. He was adamant that the Government architect was responsible to the under-secretary only and that the under-secretary was the department’s Permanent Head—that the two posts had been held concurrently by one person was irrelevant. He supported his case by pointing out that the Minister of Public Works also held a separate portfolio of Public Buildings.⁸³ The final section of his letter to the under-secretary reflected a certain amount of bitterness and resentment at the treatment of the Architectural Branch by the engineers:

“There is another matter (probably due to a reflex of the assumption that I am a cog in the engineering wheel) which I desire to bring under your notice.

I drew your attention some time ago to the fact that officers junior to me were minuting files to me—‘please advise’ or ‘for your comments’—over their own initials when those files should have come direct to me, since final action is taken by me, signed in your name if involving policy or to other Departments, or in my own name if of a technical nature.

That practice, which wastes time, still continues and a new one, to which I take exception, has recently crept in; namely Engineers minuting instructions direct to individual members of my staff, or giving verbal instructions to them on matters which have not originated through me in my branch. It is my province to delegate work to my staff, for whose actions or official opinions I am responsible, and I shall be glad if you will instruct that information required to be supplied to my office passes through the correct channel and that only officers authorised by you to deputise as Permanent Head in your absence address minutes to me. Except in cases in which you desire to personally see or sign a reply I see no need for anything more than an endorsement ‘Government Architect’ without any signature.”⁸⁴

In the reorganisation of the department into four separate but equal divisions the views of Mair about the position of the Government architect were endorsed. A memorandum to all district officers on the new system emphasised that the district architect was responsible direct to the Government architect for all building works within his district and noted that “certain authority and responsibility concerning building work now vested in district engineers will be transferred to district architects, . . .”⁸⁵ But an inquiry from the acting district engineer in Christchurch requesting a clearer definition of the respective responsibilities on building projects of the Architectural and Engineering Divisions showed that even the reorganisation had failed to resolve the conflicts between the two.⁸⁶

As Commissioner of Works, McKillop himself tried to clarify the position by advising that the Government architect and the director of housing construction were to keep the district engineer informed of “substantial works contemplated or being carried out by their divisions”.⁸⁷ But an examination of the specific queries raised reveals that the real problem lay in the increasingly complex nature of building and the increasing role of engineering services in any major construction work. This fact suggests that smooth relations between the two divisions would ultimately depend on two factors: the co-operation of the individual officers involved in a specific project and the acknowledgment by the engineers of the indispensibility of architects which alone would give the Architectural Division the confidence to deal on equal terms with the engineers.

The most significant change to follow the 1945 reorganisation was the merger of the ministry and the department. When in March 1946 W. L. Newnham retired as Permanent Head of the department, Semple announced

that the four separate divisions would now be directly responsible to the Commissioner of Works who would assume overall administrative control of the department.⁸⁸ In a memorandum to the department's controlling officers a year later McKillop described how this had worked:

"Insofar as the specific functions of the Ministry of Works were concerned, the Department came under the administrative control of this Office, but this did not involve any interference at all with the internal administration of the Department, and particular care has always been taken that contact with the Department has been made only through the prescribed channels of one or other of the four Divisional Heads, and in particular through the Under-Secretary."⁸⁹

However, in early 1947, after an examination of the department's administration by the Public Service Commission, Cabinet directed that the Commissioner of Works be regarded as Permanent Head of the department. The reasons for this decision were threefold: definite evidence of overstaffing in some categories; lack of co-ordination among the four divisions; lack of sufficiently rigid control over expenditure.⁹⁰ This step did not of itself involve a merger of the two bodies though it was a clear indication that merger would follow. However McKillop pointed out that the actual merger would have to wait until "the present field of the Ministry of Works is narrowed by the relinquishing of controls or when materials and manpower are again available to take control off all works, buildings and housing, privately financed."⁹¹ He recognised the inherent conflict of interests should the State's construction agency assume the role of controller of private construction.

The merger when it did formally occur raised the whole question of the necessity for a State planning agency independent of any one Government department. In 1946 Semple had argued for the necessity of a Ministry of Works and Planning (as he called it) because in the past public works had been done in a haphazard way:

"They had been started then stopped, according to the demand for labour in any particular district, or because of strong political pressure. No attempt had been made to plan for the future or to ensure that works carried out were essential in the national interest. . . . The spectacle had been witnessed of political roads and bridges, but with the advent of the organisation which he had been instrumental in setting up . . . [he] firmly believed that the day was past when works would be commenced without any proper consideration of their importance to the nation or their relative merits for priority."⁹²

Whether the same body which is to construct public works should also be instrumental in determining priorities in the field is still a debatable point. Although committed to long-term planning the Labour Government of the forties was clearly confused as to who should actually draw up the plans. A plethora of bodies was created and their combined effect is questionable.

The original idea was that the Ministry of Works, with Fletcher as Commissioner, was to supervise the execution of a plan for post-war recovery which the ministry would help to draw up and which Cabinet was to finalise. In 1944 the Organisation for National Development had set up councils to co-ordinate planning with due regard for local interests. However, in 1946 Semple announced that "The whole responsibility of planning the constructional activities of the State and co-ordinating State activities with private and local body projects is now in the hands of the Ministry of Works and Planning, . . ." ⁹³ A move to consolidate the ministry's planning powers occurred with the transfer of the administration of the Town Planning Act 1926 from the Department of Internal Affairs to Ministry of Works. The Town Planning Amendment Act 1948 ratified what had been practice since 1946. Regional planning had been envisaged under the 1926 Act but the local planning councils never developed as effective bodies and the Ministry of Works itself produced a "10-year plan" for New Zealand's public works development. The aim of the plan, according to Semple, was to avoid the "somewhat haphazard fashion" which in the past had determined the nature and extent of the public works programme "according to the demand for labour in any particular district, or because of strong political pressure". ⁹⁴ The concept originally aroused a good deal of favourable comment but the execution of the specific plan, partly because it involved a multiplicity of bodies—local as well as State—was never wholeheartedly pursued. Semple's successor to the Works portfolio, Stanley Goosman, in fact described this attempt at long-range planning simply as "a bit of window dressing" ⁹⁵ by his predecessor. To which Semple apparently retorted: "The present Minister of Works has got his foot in the wrong bog." ⁹⁶ Nevertheless the Labour Government's commitment to long-range planning was not as determined as its rhetoric sometimes implied.

The failure to carry out the "10-year plan" proposals was due in part to the lack of co-operation at local body level. But it also reflected the serious shortage of skilled staff which plagued the country's construction programme after the war. When the Government announced its plans the South Auckland branch of the Professional Engineers' Association asserted that "the proper design and adequate supervision of the major engineering works" involved "were not remotely within the capacity of the present numerical strength of Government engineers". ⁹⁷ It urged that Government service be made more attractive to them. While such a shortage was to be expected immediately following the war, the situation was still serious at the end of the forties. The Commissioner of Works produced some interesting figures in January 1949. He pointed out that at that date there were 11,103 men employed on civil engineering works and buildings (housing excluded) and 331 engineers. In 1938 there had been 23,851 men and 352 engineers (of whom 46 were

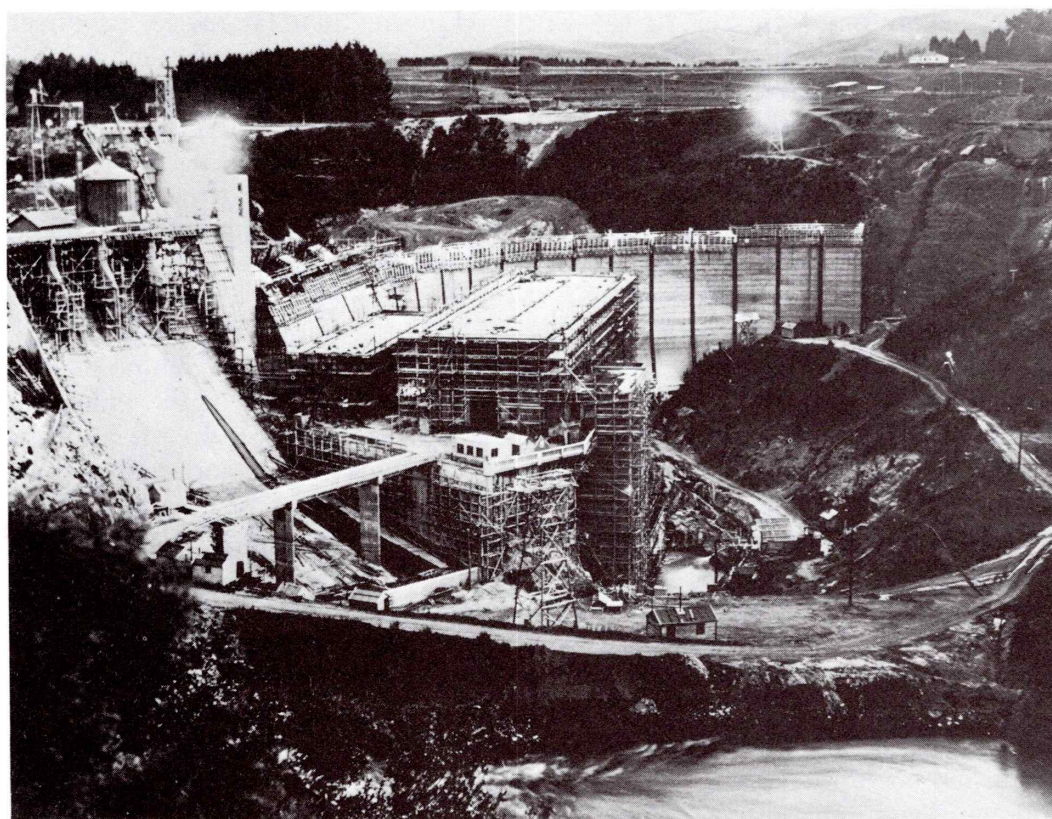
electrical), and he commented that "It is known that there was insufficient engineering staff in 1938 adequately to cover the department's activities. It is true also that considerably more investigation and design work is [now] being undertaken", and suggested the engineer-in-chief carefully investigate the staffing situation with a view to having the matter taken up immediately with the Public Service Commission.⁹⁸ The problem was not just a New Zealand one. There was a world-wide shortage of qualified professional staff; but local public service salaries in the 1940s aggravated the situation for Ministry of Works.⁹⁹ Nor were staffing difficulties limited to the professional level. The 1945 Public Works statement commenting on the shortage of manpower in the building industry foresaw that even when released servicemen became available in significant numbers the problems would not be immediately solved because of the difficulties of readjustment to civilian life.¹⁰⁰ Lack of timber supplies in particular caused serious delays in the industry but many ex-servicemen were reluctant to return to the bush. There was to be no easy solution.

Despite the post-war limitations on personnel and materials the Minister of Works pointed out in 1947 that the accumulated and potential demands upon the construction industry generally and the Public Works Department in particular, were greater than at any time in the country's history. The post-war pattern for public works was in fact emerging before the war ended. In 1944 Semple wrote to his colleague, the Minister of Defence, expressing deep concern for the national housing construction programme. Like all civilian works it had been drastically curtailed, but now Semple warned that he proposed "taking all possible steps to reduce the diversion of men and materials from this main object". Requests from the armed services for defence construction were to receive "the closest scrutiny" before any approval would be given.¹⁰¹ From the time the housing construction accounts were incorporated with those of the Public Works Department it was clear that housing was indeed the number one priority. In the 1944-45 financial year it absorbed 31.7 percent of the public works expenditure. This grew to 54.6 percent in 1946-47 and remained around the 50 percent mark until the early fifties. In the 5 years ended 31 March 1950 over 17,000 dwelling units were completed by the department.

One of the most interesting developments in the forties was the more careful planning and design of construction towns instead of allowing the haphazard development from an aggregation of huts that had prevailed in the past.¹⁰² The Mangakino township provided the opportunity for better planning because it was designed to serve several of the Waikato power schemes. The workers there profited from the greatly improved living conditions that resulted, though initially the hydro townships were not particularly sophisticated. At Mangakino, for example, the department's permanent

staff lived in areas quite separate from the workers or employees.¹⁰³ This clearly emphasised the social divisions apparent in the work force and doubtless was a factor (albeit a small one) in the unsettled relations between the department and the local branch of the New Zealand Workers Union.*

Expenditure on hydro-electric development also increased rapidly as defence demands waned. By 1944–45 it amounted to 19.5 percent of the public works total and fluctuated around this level until the end of the decade, after which it increased rapidly. The disruption of the hydro-development programme first by the depression, then by the war, by the mid-forties led to demand greatly exceeding generating capacity and rationing of electric power became a necessity. Several schemes were extended or completed during the forties including Arapuni, Karapiro, Highbank, the Cobb River scheme, and the Waikaremoana lower development; other projects were under way at Lake Tekapo, Waitaki, Maraetai, Whakamaru, Upper



Construction of the Karapiro power scheme, on the Waikato River below Arapuni, was considerably delayed by the war. This view, taken in 1946, shows work again in full swing. *N.Z. Free Lance. Turnbull Library.*

*One of the worst industrial crises occurred when engineers threatened to resign en masse if the secretary of the local Communist Party branch was not dismissed from the job. They believed he was the source of much of the unrest. An inquiry into the affair concurred with them in a highly controversial decision.

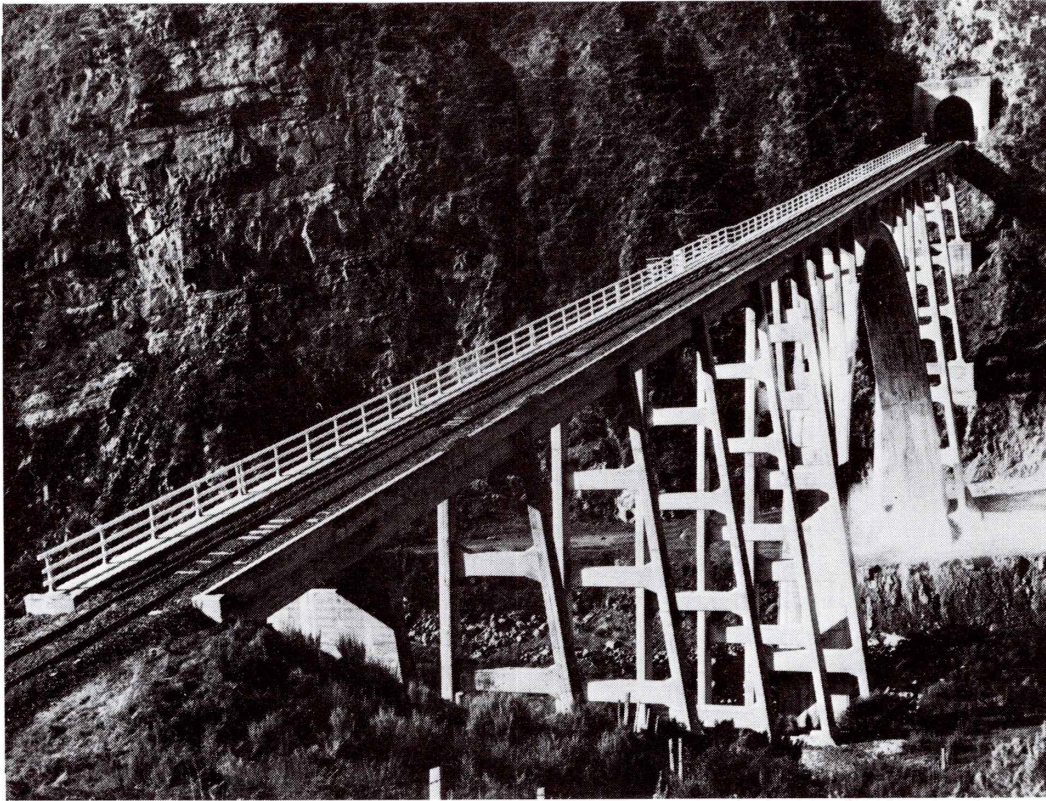
Waikaremoana, Lake Pukaki, and Roxburgh. And the enormous expansion in this field that was to come in the subsequent decades was foreshadowed in the amount of investigation work being undertaken: at Kaituna, Waipapa, Atiamuri, and Ohakuri on the Waikato, at Braeburn in the Nelson district, at Lakes Hawea and Wanaka, and in the Manapouri – Te Anau area.

Expenditure on roading and highways by the Public Works Department dropped during the war from 20.4 percent of the department's budget in 1940–41 to 1.8 percent in the 1942–43 fiscal year. It did not recover as quickly as did expenditure on housing and hydro-electric schemes but by 1949–50 it received 16.5 percent of the available finance. In the fifties and sixties it ranked with hydro-electric development and housing as one of the Ministry of Works three major activities. Its neglect during the war created an enormous backlog of work which post-war shortages aggravated still further. In 1947, for example, Main Highways Board engineers reported that 700 bridges needed renewing—300 of these within 3 years. Yet by 1950 only 14 of them had been built, and work was in progress or contracts let for only another 30.¹⁰⁴ F. M. Hanson, then Highways Engineer to the Main Highways Board, suggested that considering the magnitude of the road transport industry, neglect of roading and in particular lack of road research facilities in New Zealand almost certainly adversely affected the national economy as a whole.¹⁰⁵

The decline of railway construction reflected of course the growing strength of its major competitor. In fact the great railway era had really ended in the thirties but three events recalled it nostalgically in the forties: the opening in 1943 of the Napier–Gisborne and Westport–Inangahua lines, followed by the completion in 1945 of the last section of the South Island main trunk railway, between Hundalee and Kaikoura. This latter line completed a connection conceived in the 1880s and forged the last link in the line from Bluff to Picton. It also marked the completion of a system of railroads connecting most of the main centres of population. Railway work undertaken since has been either the construction of lines for a specific purpose, such as that to Murapara, or the improvement of existing facilities, for example the Rimutaka deviation.

During the forties problems encountered on another deviation—between Turakina and Okoia—caused the department some considerable embarrassment and confirmed the need for following long-established procedures, some of which may appear as over cautious. The need for the immense amount of paperwork involved in administering a State department, so frequently dismissed as unnecessarily bureaucratic, was for once vindicated, as the following summary of events leading up to an inquiry into the construction of the Turakina–Fordell tunnels will show.¹⁰⁶

Between Marton and Wanganui the railway runs parallel to the coast.



Here by a structure 530 ft long the railway between Wairoa and Gisborne is carried across the valley over 100 ft above the Waiau Stream. The 180 ft span is the longest arch used for a railway bridge in New Zealand. Completed 1942. *Ministry of Works.*

It has to cross three rivers and as originally built had to climb over the spurs between them, giving sections of tortuous alignment with steep grades. Surveys for deviations were made as early as 1894 but work actually began only in 1936. The new route included tunnels through two spurs—the Tura-kina of 104 and Fordell of 72½ chains in length.

Starting with the Lyttelton tunnel in the 1860s the traditional shape of railway tunnels in New Zealand has been a horse shoe section. By the 1930s tunnels had become larger and minor changes had been made but the basic shape remained. However, in the mid thirties drawings were prepared for a new tunnel section for use on the Waikokopu–Bartletts link of the Napier–Gisborne railway where exposures had shown stratified rock with alternating layers of papa and sandstone. The drawings were of a tunnel section with a semi-circular roof and straight vertical sides, a shape which had been extensively used in America.¹⁰⁷ Drawings were also issued for the American

system of timbering and for mobile steel formwork to be used with the section.¹⁰⁸

Apart from the tunnels on the Gisborne line and some recently started on the South Island main trunk it was some years since tunnelling had been commenced on an extensive scale. With this lapse of time and with the issue of all these new drawings the idea became current that the section with straight sides was a new standard for general use. Apparently without reference to the designing engineer, who had issued the plan entitled "Gisborne-Napier Railway. Amended Tunnel Section", copies were sent to the district engineer at Stratford for use on the deviation. In light of subsequent events the use of the word "amended" in the title was unfortunate. It was correctly used, in that this plan, P.W.D. 93527, was an amended version of P.W.D. 93201, an earlier cancelled version of the same section, but anyone not knowing this could regard it as an amendment of the standard horseshoe section.

Work on the Fordell tunnel started in August 1937 and on Turakina a month later. It was "decided to use the Canadian method of timbering with the latest type of scraper mucking, steel profiling for the concrete lining, and electrical operation of scraper-winch and air-compressors for drilling, while the transport of material is [to be] done by electric-battery locomotives. Concrete for the internal lining of the tunnel will be mixed by electrically-driven concrete-mixers and conveyed and deposited by the latest type of pneumatically operated 'concrete guns'."¹⁰⁹

The first sign of any defect was observed in the Fordell tunnel on 28 November 1938. The Assistant Engineer in Charge, B. C. Annand, reported to the resident engineer at Wanganui that "the concrete lining of the completed portion of the south end showed long cracks roughly parallel to formation level."¹¹⁰ This information was passed on to Head Office and on 23 January 1939 the district engineer advised that the cracks were extending. Further reports were sent forward, one of which in June 1939 stated that cracks were getting progressively worse and that the assistant engineer considered some action necessary. Apparently none of these reports went beyond the inspecting engineer, and suggested action concerned remedial measures for known cracks. Tunnelling was still proceeding and apparently no one questioned the adequacy of the section being used. Tunnelling through rock had been anticipated but the ground turned out to be sand and clay or papa. Plan P.W.D. 93527 calls for thickness in walls and roof of "1' 0" (min.)" so greater thicknesses could be used at the discretion of the engineer. The tragedy of this aspect is that on the South Island main trunk railway, where the straight-sided section was also used, cracks in a wall were noticed and reported in July 1938.¹¹¹ Plans for an amended section with walls 1 ft 9 in. thick were immediately issued from the Design Office.¹¹² Plans for another tunnel involving special circumstances, with steel reinforcing included, had

been issued in June 1937.¹¹³ Evidently on the Gisborne line also the thickness was increased to 19 in.¹¹⁴ The Fordell tunnel was pierced in May 1939 and Turakina in April 1940. A close watch was kept on the cracks and studies were made to ascertain the best method of strengthening the damaged sections.

Then, in March 1944, the matter was raised in Parliament¹¹⁵ and in May 1944, in terms of section 12 of the Public Service Amendment Act 1927, the Public Service Commissioner, J. H. Boyes, conducted an inquiry. Associated with him for professional and technical assistance and consultation were H. Vickerman, M.Sc., M.Inst.C.E.*, consulting engineer, and W. Brooke, a practical tunneller. The report of this inquiry, published in the *Appendices to the Journals of the House of Representatives 1944* as D. 6, should be required reading for all senior officers. Some of the remarks may be regarded as counsels of perfection, but they do serve to indicate reasons behind certain procedures. A summary from reading the conclusions in the report follows:

1. The need for decisions arising from oral discussions to be properly placed on record, either by memorandum or by minute on the file. Such records should be explicit and should include dates, names, file, and plan numbers.
2. The necessity for the fullest possible investigation to determine conditions likely to be met where underground structures are concerned, e.g., tunnels and foundations of structures.
3. The need to correlate conditions disclosed with those expected and to question whether the structure as designed satisfactorily meets any changed conditions. If there is doubt the matter should be reported back to the officer who prepared the design. Even junior engineers have a duty in this respect as they are often more closely in touch with the work than are senior officers. Again written reports put such matters properly on record.
4. Non-receipt of expected plant may call for changes in working methods. (On these works it was intended to place tunnel lining concrete by pneumatic equipment. Not all the tunnel faces were so equipped but timbering was not changed to suit the requirements of hand placing.)
5. Any signs of distress in a structure must be reported immediately to higher authority. Prompt and thorough measures to ascertain the cause are called for.
6. If staff in any grade, engineering, administrative, or supervisory, is inadequate for the job the onus is on the engineer to make *written* representations for the additional assistance necessary. Oral requests alone are insufficient and should be confirmed in writing.

The above emphasise the need for an engineer to be continually alert. Questions as to adequacy of design and suitability of construction methods

*Equivalent
F.Inst.C.E.

later to

do not arise with the onset of failure. They are there from the start of planning and must be continually under review.

On the whole however there were few such incidents to detract from the positive achievements of the Public Works Department in the forties—or the Ministry of Works as it had become by the end of the decade.* As always it was to the forefront in pioneering new developments and devising new techniques. One of the most exciting in the immediate post-war period was the use of light aircraft for aerial top dressing and associated activities.

Originally the idea to use aircraft for such work occurred to the chief pilot in the Aerodromes Branch† as he was flying low along the North Island coast using the “up-drafts” to save fuel. A. M. Pritchard recalls how it happened:

“As I rounded the southern headland of the Marakopa River and with my wing-tip about 30 ft out from the hillside suddenly there was a farmer broadcasting either fertiliser or seed by hand. His horse took off in fright. I turned seawards in order to examine the havoc I may have caused, but the horse could not have gone far, for by the time I turned shoreward again, the farmer had caught the horse and was stroking it. He gave a friendly wave and I continued on my way. This really set me thinking that it might be possible to use an aeroplane for this sort of work instead of all the hard labour around these hill faces. By the time I got back to Wellington I had worked out pretty much that it could be done and excitedly in the office the next morning told Gibby, [Gibson], Doc Haskell, and Eric Smart. Eric and Gibby laughed me to scorn but Doc came to me at morning tea time and said: ‘Look, I think there is something in this thing, you stick to it for a while and give it a bit more thought’, and later when Doc became aerodromes engineer I was able to do something about it.”¹¹⁶

He remembers that the initial difficulties were lack of money, the unreliability of light aircraft engines at the time, and the lack of knowledge about conditions when flying close to the ground in turbulence. The first experiment in seed sowing from the air actually occurred during the war at Waipapakauri, where an experiment showed that by the use of aircraft the sowing rate was reduced from 9 lb of seed per acre to approximately 2. But this comparison was loaded as Prichard amusingly relates:

“The call to go back to Waipapakauri came much sooner than expected and with the full support and blessing of the district engineer, Whangarei. In view of the limited and primitive nature of the trials I was at a loss to understand this wholehearted conversion to the ‘aerial method’. On my arrival a triumphant and smiling Harrington-Smith, the overseer, gave me the answer. The department bought its seed from school children who collected it in their holidays. It was their fathers who hand broadcast it on to the sand dunes. Every so often when the boss wasn’t looking they buried a sack of seed in the sand and at night the youngsters came back and dug up that sack

*Under date 26 May 1948, Cabinet approved of the Public Works Department being merged in the Ministry of Works for all administrative purposes under the Commissioner of Works as permanent head. (Commissioner of Works circular memorandum 1 June 1948).

†The work done in New Zealand on aerial sowing and topdressing had been preceded by overseas experiments, but as Prichard said the peculiar topographical and climatic conditions of the country are quite different from the vast level expanses where these developments had taken place. (*N.Z. Journal of Agriculture*, Vol. 70, pp. 117–120, Prichard, A. M. 1945 “Air Sowing, Application and Limitations”). Prichard and his colleagues in the Aerodromes Services Branch also developed methods of supplying isolated back country farms from the air, and of provisioning Department of Internal Affairs deer cullers to enable them to remain on the mountains for longer periods.

and sold it back to the department. This was one reason why a sowing rate intended to give nine seeds per square yard worked out at 9 lb per acre. The aircraft of course eliminated all this and did the job far quicker. Eventually we sowed many thousands of acres along the Ninety Mile Beach. Thus the break through for aerial work, which ultimately led to aerial topdressing, got off the ground not because of technical superiority, but because an astute overseer and a determined engineer decided to thwart the frailties of human nature."¹¹⁷

No money was available for the early experiments and only somewhat unusual arrangements allowed them to get under way. Semple, who after reading an article by Prichard in the *Journal of Agriculture*, took considerable interest in the project, apparently knew of and condoned these unorthodox arrangements. The financial difficulties were eventually overcome when the idea was taken up by the Soil Conservation and Rivers Control Council. Their problem was to find a means to maintain adequate pasture cover on steep hillsides. Packing seed and fertiliser and hand sowing was too laborious and costly so they were quite prepared to put money into a development that promised a solution. In 1947 they undertook to organise and finance the trials necessary to bring aerial topdressing to the stage of being a commercial proposition. But the effort was very much an inter-departmental one, with the Works Department and the RNZAF playing the most prominent roles.¹¹⁸

The end of the forties saw the end of Robert Semple's reign as Minister of Works. In many ways his is a contribution difficult to accurately assess for



The pilot's dream achieved. Aerial topdressing from a plane operating below the Remarkables, near Queenstown. *National Publicity Studios*.

the overwhelming dominance of his personality tends to both obscure and exaggerate the concrete achievements of his ministry. Certainly the war years had the effect of rendering Public Works policy much less controversial and the subject of somewhat less public debate than it had been in the late thirties. It was not unusual during the early forties for the Speaker of the House of Representatives to have some difficulty in obtaining a quorum during consideration of the Public Works annual statement.¹¹⁹ James Fletcher believed that once the focus of the nation was on the war effort Semple lost interest in Public Works and preferred to tour the country whipping up support for the National Service Department of which he was Minister, hence his replacement by Armstrong in the Public Works portfolio. On his resumption of control he was extremely jealous of any potential loss of authority and he seems to have tried to ensure his own seniority in Cabinet by initially strictly controlling and then downgrading the planning functions of the Ministry of Works by absorbing it in the Public Works Department and simply changing the names. By the late forties, however, his attention was again wandering from public works as he threw himself into a vigorous anti-Communist campaign.

Evening Post



UP THE GARDEN PATH.

Semple's relations with Public Works Department staff were never entirely happy. The authoritarian streak in his personality and his use of colourful, vigorous, and uncompromising language to express his views combined to antagonise some—though the present day researcher must feel grateful to Semple for his injection of life and often unintentional humour into many otherwise dull Parliamentary debates! A previous chapter has already dealt at some lengths with the Labour Minister's relations with his departmental officers but it is worth providing a further illustration of a typical comment which could have caused resentment amongst both Public Works Department staff and employees who had been operating throughout the war period under considerable strain. Speaking of the post-war period he said:

"We want no slumming, so [*sic*] sabotage, and no imposters on the job. I have done some purging in the past in the Public Works Department and there will be some more purging in the future when the war is over. We have heard a lot about a new-born world and a new system, but we will not get it unless we are awake."¹²⁰

There could have been little justification at the time for such an implicitly critical statement.

When however, Semple did get on well with individual members of the department he gave them his full confidence. T. G. Beck* was such a person. He was undoubtedly an engineer of exceptional ability as his staff records show. His superiors at various times described him as "an exceedingly good officer", "much above the average young man", "unquestionably an outstanding officer".¹²¹ He was transferred from Christchurch to Head Office as acting inspecting engineer at the end of 1942. A year later Semple wanted to have him appointed acting second assistant engineer-in-chief at the same salary as the assistant engineer-in-chief. The move aroused considerable resentment amongst senior officers and in an unprecedented action 11 of them wrote to the Prime Minister opposing the appointment. In essence they argued that he was younger than most, his experience in senior positions was limited, his qualifications were not superior, and that his appointment would rank him third engineer within the department ahead of 11 officers who were currently senior to him. Finally they resented the fact that he was appointed in an "acting" capacity and therefore was not subject to normal Public Service appeals procedure.¹²²

Semple was adamant and argued that 9 of the 11 engineers concerned were due to retire within the next 5 years and that Beck's appointment was aimed at ensuring "continuity of service in young and capable hands".¹²³ Cabinet demurred at the engineers' request to reconsider the matter and the opposition was simply left to fade away. That Semple had plans for Beck was clear when in February 1946 he became Acting Assistant Commissioner of Works then later that year he became Deputy Commissioner.¹²⁴ However, his health

*For brief biography see p. 285.

which had been deteriorating since the middle of 1945 forced him to take sick leave in July 1947 and he died in January 1948 without achieving the highest post which obviously had been intended for him.

During the virtually continuous 14 years of Semple's ministry, the Public Works Department became the large, sophisticated, multi-faceted, and im-personal organisation that it is today. Partly this was the inevitable result of its growth, even more it was caused by the increasingly detailed, complex, and highly technical nature of modern construction and public works projects generally. In the last two decades of the department's first century the focus was to be on developing adequate methods successfully to weigh and balance the multitude of factors that now determine public works policy.

(Table referred to on page 171.)

The following figures show how total expenditure by the department climbed during the war without a corresponding increase in staff. Total expenditure includes expenditure on defence works:

Financial Year	Total Expenditure	Defence Expenditure	Workmen Employed at 31 March	Staff Employed at 31 March
	£	£		
1939-40	16,952,507	3,568,215	19,531	3,340
1940-41	16,059,660	3,384,158	14,797	3,095
1941-42	15,164,060	5,340,505	12,478	2,901
1942-43	24,807,936	16,507,422	14,243	2,889
1943-44	21,571,792	11,485,447	11,663	3,031
1944-45	16,271,991	4,760,761	10,248	3,376

From *OWH/PWD*, Vol. II, page 323.

REFERENCES CHAPTER 8

- 1 *A.J.H.R.*, 1940, D. 1, p. xi.
- 2 *Ibid.*, p. v.
- 3 *Ibid.*, 1942, D. 1, p. i.
- 4 See for example *Ibid.*, 1940, D. 1, p. 58.
- 5 *Ibid.*, 1941, D. 1, p. iii.
- 6 *Ibid.*, 1943, D. 1, p. i.
- 7 *Official War History of the Public Works Department* (hereafter *OWH/PWD*), unpublished, Wellington, 1948, Vol. 1, p. 90.
- 8 *Ibid.*, p. 73.
- 9 *Ibid.*, preface.
- 10 *AJHR*, 1940, D. 1, p. v.
- 11 *OWH/PWD*, Vol. II, p. 358.
- 12 *Ibid.*, Vol. I, p. 113.
- 13 Robinson, N. *James Fletcher: Builder*, London, Hodder and Stoughton, 1970, p. 129.

- 14 Baker, J. V. T., *War Economy*, Wellington, Department of Internal Affairs, 1965, p. 227.
- 15 *OWH/PWD*, Vol. I, p. 23.
- 16 *AJHR*, 1943, D. 1, p. 5.
- 17 Ibid.
- 18 Robinson, p. 129.
- 19 Ibid., p. 130.
- 20 Ibid.
- 21 Ibid., p. 129.
- 22 Ibid., p. 148.
- 23 For details see *OWH/PWD*, Vol. I, p. 183, et seq.
- 24 Ibid., p. 192.
- 25 Ibid., p. 194.
- 26 Ibid.
- 27 Ibid., pp. 244-5.
- 28 Ibid., p. 249.
- 29 Ibid., p. 252.
- 30 Ibid., pp. 262-3.
- 31 For details see Ibid., p. 262, et seq.
- 32 Ibid., p. 280.
- 33 Ibid., pp. 284-5.
- 34 Ibid., p. 287.
- 35 Ibid., p. 287.
- 36 *ibid.*, Vol. II, p. 322.
- 37 Robinson, p. 140.
- 38 *OWH/PWD*, Vol. II, p. 292.
- 39 Ibid., pp. 302-3.
- 40 P.W. 32/8793, 17 June 1940.
- 41 Ibid., 31 July 1940.
- 42 Ibid., 23 August 1940.
- 43 Ibid., 23 April 1941.
- 44 Ibid., 9 June 1941.
- 45 Ibid., 12 December 1941.
- 46 Ibid., October 1941.
- 47 *Star-Sun*, 6 October 1941, p. 6.
- 48 *OWH/Aerodrome Services Branch*, pp. 32-36. (Hereafter *OWH/ASB*.)
- 49 Ibid., p. 34.
- 50 This section on Ardmore is based on the account in *OWH/ASB*, pp. 43-44 and 79.
- 51 Ibid., pp. 6-7.
- 52 Ibid., p. 7.
- 53 Ibid., p. 8.
- 54 Ibid., pp. 73-74.
- 55 *AJHR*, 1944, D. 1, p. i.
- 56 Ibid., 1943, D. 1, p. i.
- 57 Robinson, p. 161.
- 58 Ibid., p. 162.
- 59 P.W. 28/393, 4 August 1943, p. 1.
- 60 Ibid.
- 61 Ibid., p. 2.
- 62 Robinson, pp. 162-3.
- 63 P.W. 28/393, 17 May 1943, p. 2.
- 64 Ibid., p. 3.
- 65 Ibid., 21 June 1943.
- 66 Ibid., 10 June 1944.
- 67 Ibid., 22 June 1944.
- 68 Ibid., 28 July 1944.
- 69 Ibid., 21 February 1945, p. 1.
- 70 Ibid., pp. 1-3.
- 71 Ibid., 11 April 1945, p. 1.
- 72 Ibid., 21 February 1945, p. 4.
- 73 Ibid., 17 October 1945, p. 1.
- 74 Ibid., Circular Memo. M. 79, 17 September 1947.

- 75 *Northern Advocate*, 12 April 1945.
- 76 *Evening Mail*, 13 April 1945.
- 77 *Gisborne Herald*, 27 September 1945, p. 4.
- 78 P.W. 28/393, Pt. II, 19 October 1950.
- 79 Ibid., 7 May 1947.
- 80 Ibid., Pt. I, 9 August 1946, p. 1.
- 81 Ibid., Pt. II, 24 January 1947.
- 82 Ibid., 22 May 1947.
- 83 Ibid., Pt. I, 10 December 1940.
- 84 Ibid.,
- 85 Ibid., 11 April 1945.
- 86 See Ibid., Pt. II, 7 February 1947, also 12 March 1947: and similar problem from Wellington district architect, 18 April 1947.
- 87 Ibid., 2 May 1947.
- 88 *AJHR*, 1946, D. 1, p. 1.
- 89 P.W. 28/393, Pt. II, 28 April 1947, p. 1.
- 90 Ibid., p. 2.
- 91 Ibid., p. 1.
- 92 *N.Z.H.*, 26 February 1946, p. 6.
- 93 Ibid.
- 94 Ibid.
- 95 *N.Z.E.*, Vol. 5, 1950, p. 407.
- 96 Ibid.
- 97 *N.Z.H.*, 17 June 1946, p. 9.
- 98 P.W. 28/393, Pt. II, 20 January 1949.
- 99 Sutch, W. B., *The Quest for Security in New Zealand 1840-1966*, Wellington, Oxford University Press 1966, p. 346, et seq.
- 100 *AJHR*, 1945, D. 1, p. v.
- 101 P.W. 28/393, Pt. I, end July 1944.
- 102 For details see Hasman, C., p. 44, et seq.
- 103 Ibid., pp. 76-77.
- 104 *N.Z.E.*, Vol. 5, 1950, p. 695.
- 105 Ibid., Vol. 3, 1948, p. 247.
- 106 The author is indebted to J. H. Christie for the technical information which follows.
- 107 Plan P.W.D. 93527.
- 108 P.W.D. 96587 and 96420.
- 109 *AJHR*, 1937, D. 1, p. 34.
- 110 Ibid., 1944, D. 6, p. 2 and P.W.D. 101799.
- 111 P.W.D. 99987.
- 112 P.W.D. 99994.
- 113 P.W.D. 96220.
- 114 *AJHR*, 1944, D. 6, p. 5.
- 115 *NZPD*, Vol. 264, p. 671.
- 116 Edited typescript from tape-recording, deposited M.O.W. library.
- 117 Ibid.
- 118 For full details of this later stage in the development of aerial top-dressing and sowing see Alexander, G., and Tullett, J. S., *The Super Men*, Wellington, Reed, 1967.
- 119 See for example *NZH*, 27 September 1941, p. 13.
- 120 *Press*, 4 July 1944, p. 6.
- 121 *NA*, SSC 5, No. 9803.
- 122 Ibid., 21 December 1943.
- 123 Ibid., 24 December 1943.
- 124 *NZG*, 1946, p. 1021.

CHAPTER 9 / *Problems and Prospects— Public Works 1950–1970*

*“We do not want to boast but we should all
rightly take pride in our achievements.
Therefore please make yourself familiar
with those achievements.”*

F. M. Hanson, Commissioner of Works, to all
Ministry of Works officers, 29 September 1958.

After 14 years in office the Labour Party was defeated in 1949 by opponents who promised fewer controls, more competition, and a better deal for private enterprise. The National Party combined these generalities with some specific promises (for example of tax concessions to special groups and the option to State tenants to purchase their houses) to appeal to an electorate impatient with the continuing post-war restrictions and shortages. The differences between the two parties implied very real changes in public works policy under a new Government. The proportion of State construction undertaken by the department with its own work forces seemed likely to decline. The role of the ministry in assessing and planning the country's physical needs, then co-ordinating these with the available resources, limited though it may have been under Labour, was likely to be of even less significance under National. In some areas the National Government made it clear that it hoped to reduce State activity to a minimum. It was Government policy for example “to encourage people to build their own homes”¹ and to ensure this occurred there was to be a reduction in the amount of money available for State housing construction. As if to underline the new attitude to public works, W. S. Goosman, in private life a roading contractor, was appointed to the portfolio.

In his first annual report as Minister of Works he emphasised that the Government would not “draw upon the limited construction potential” available in New Zealand at the time to the detriment of local authorities and private individuals.² He also forecast an extension in the amount of public works carried out by contract, commenting that “the Department's labour force [should be] limited to that required for works of a maintenance character and to such other works which for various reasons cannot be submitted to public tender.”³ He seemed to be suggesting that ultimately the Ministry of Works should revert to its original functions of design and supervision with only minimal construction responsibilities. Circumstances, however, were to prevent any such drastic occurrence although the proportion of construction work carried out by the department itself has declined. At the end of Ministry of Works's first century (1970) the basic question of the extent to which the department should be involved in actual construc-

tion still remains unresolved. Indeed perhaps now more than ever there is disagreement over what the exact role of the department should be and what should be its precise function.

In fact the situation in 1950 left the National Government with considerably less room for manoeuvre and change than it had apparently expected. It inherited an enormous backlog of urgent capital works which had accumulated with the suspension of normal activities during the war and which continued to accumulate, as Semple had pointed out in 1947, at a rate substantially greater than could be handled with the post-war shortages of manpower, materials, and plant. To eliminate continuing power shortages enormous hydro-electric and thermal development schemes were required; the housing situation was acute—it was estimated that at the end of the forties a shortage existed of over 20,000 houses, in addition to the 6,000 or 7,000 required annually to cover increase in population and obsolescence.⁴ Applicants for State houses classified as urgent numbered 25,544 in 1948, with a total of 52,186 unsatisfied applicants altogether.⁵ A similar position existed in almost every area of public works—the Main Highways Board estimated in 1950 that of 700 bridges requiring renewal 286 were “most urgent”.⁶ The work of Government departments was seriously hampered by inadequate accommodation. It was obvious that although there might be a change of priorities or emphasis, there could be no serious cutback in public works expenditure. By 1956 Goosman could announce that the apportionment of construction capacity was on the basis of one-third each to private, local bodies, and State activities, whereas in 1950 it had been in the order of State 42 percent, local body 32 percent, and private 26 percent.⁷

But it was evident that as long as supplies of labour, materials, and plant were limited then some sort of control would have to be exercised over their distribution. By the mid fifties shortage of materials was no longer a serious problem. Lack of steel and cement held up progress on many projects in the late forties, but by 1950 steel at least was becoming available in reasonable tonnages.⁸ Then the rearmament programmes of the United States and Great Britain caused renewed restrictions. The lack of cement was caused by the inability of the local industry to meet the current demands. In the early fifties the shortage of these two vital commodities was a significant factor not only in delaying the execution of authorised projects, but also in pushing up costs.⁹ By 1956, however, the Commissioner of Works was able to report that the supply of construction materials had improved considerably and that where hold-ups did occur they were usually caused only by some local or temporary shortage.¹⁰

Unfortunately staffing and labour problems were not rectified so rapidly. Initially the shortages were experienced right through the employment scale,

from the unskilled to the professionally qualified. In 1951 the Commissioner of Works pointed out that the problem was nation-wide:

"... the labour force remaining to us is still insufficient to man fully the works to which the Government is committed, and, further, there is insufficient labour in the country to equip the industries the output of which is required for construction purposes."¹¹

At one stage the hydro-electric project at Roxburgh was 200 men short.¹² In the early fifties the situation was further aggravated by the industrial unrest which culminated with the waterside workers' strike. On some public works the labour force came out in support of the strikers; and other projects were delayed because related essential industries, for example the cement works, closed down.¹³ By 1955 there was an overall improvement in the general availability of unskilled, semi-skilled, and skilled workmen, though the Ministry of Works did not enjoy a proportionate share of the increased labour force. Only advanced mechanisation and improved techniques enabled the department to contend with the volume of work assigned to it. However, by the middle of the fifties the nature of the problem was changing. Manpower was available within the community but it was a question of attracting and retaining it. Although the numbers employed might be reasonably steady the high turnover experienced seriously affected the work force's efficiency. The department completed its first century with no apparent solution—in some quarters the policy of full employment has been blamed for worker mobility, but it is worth noting here the Ministry of Work's experience between 1967 and 1969:

"Although the level of unemployment which resulted from the economic difficulties over the past 2 years might have suggested a more ready availability of staff, particularly at the basic and unskilled level, this has not proved to be the case. Turnover of employees, especially at the lower grades has continued at much the same level as in previous years. Suitable replacements have not been easy to obtain."¹⁴

Initially the lack of technical and professional personnel could be attributed to the cumulative effects of the depression and the war, but when it persisted well into the sixties then reasons for it had to be sought elsewhere. In this field the National Government had inherited an already critical situation which it aggravated by relaxing controls on construction throughout the country and by allocating a greater proportion of construction work to private enterprise. The fact was that from the time the war ended technical staff from the Ministry of Works (and indeed throughout the public service) had been attracted away from Government service into private employment both locally and overseas. With an increased amount of work going to the private sector this trend was intensified. Two examples show the seriousness of the position at the beginning of the 1950s: despite advertising

architectural and draughting positions within New Zealand and overseas the Architectural Division was unable to offset the loss of staff it suffered;¹⁵ the Hydro-electric Design Office was able to fill only 2 out of 17 vacancies advertised abroad¹⁶ and investigations into the development of electric power had to be carried out in 1950 with only half the Head Office staff available the previous year.¹⁷ Throughout the next 20 years the refrain of insufficient qualified staff was to become only too familiar:

In 1952, the Commissioner of Works—

“In the engineering field alone the number of recruits from the United Kingdom and Holland totalled 84, while the loss of staff in this one field during approximately the same period was 88 officers.”¹⁸

In 1955, the Government Architect—

“... great difficulty has been experienced during the year because of the shortage of qualified staff. Fifty-nine registered architects were employed at the end of the year. During the year fifteen architects resigned, but as the result of recruitment in England eight architects took up appointment with the Division. ... As the Division was already understaffed before the year commenced, the steadily decreasing staff has been the cause for deep concern.”¹⁹

In 1958, the Engineer-in-Chief—

“There was a severe shortage of professional engineering and technical staffs and there were no indications of early improvement in this field.”²⁰

In 1961, the Commissioner of Works—

“Added now to the shortage of young engineers, architects, and draughtsmen, there is a serious need for young qualified accountants, solicitors, and other administrative people and the position is deteriorating.”²¹

In 1965, the Commissioner of Works—

“The Department is still faced with shortages of suitably qualified staff ...”²²

Every annual report made between 1950 and 1970 contains comments such as these. As the nature of the department's activities became more complex, the demand for specialised staff grew more acute. The Commissioner of Works pointed out that staff requirements were no longer related to the old “volume-of-labour” yardstick only; “they are now influenced more by plant and machinery, construction techniques, the growing contract forces, and the need for highly qualified investigational and design teams to meet the more complex technological demands of today.”²³ In the middle sixties it looked as if the town planning section would simply cease to exist through lack of personnel,²⁴ yet town planning is a basic requirement for the orderly development of an affluent, industrialised society.

There were many aspects to the problem. The effects of restricted training opportunities during the depression and the war resulted at the end of the

fifties in a serious shortage of qualified staff in the middle age groups.²⁵ By 1961 the department could see no way of filling the gap created by this particular shortage and advocated accelerated training and promotion for young people.²⁶ As serious as the inability to recruit trained staff was the inability to retain those employed. With the exception of that for the year 1967–68, every annual report records a high turnover in staff. Numbers employed remained static. The appointment of young trainees in no way compensated for the loss of senior and experienced staff. And even when qualified personnel were available the necessity of supervising the work of new appointees, whatever their calibre and qualifications, limited the output and effectiveness of longer service employees. Losses of professional staff has continued at a high level into the seventies. To give but one example, between 1965 and 1970 the net turnover of civil engineers in the important 30–35 age group was 100 percent! Another feature of the problem which emerged in the sixties was the difficulty of attracting staff to Wellington. The 1968 report of the Roothing Division noted that it had to advertise for 11 months to fill the vacant post of highways maintenance engineer and 5 months for the position of materials and design engineer.²⁷ In some fields, such as town planning and building services, training facilities were either not available in New Zealand or were totally inadequate to meet the demand.

The effects of this situation were threefold, essential works had at times to be deferred, staff worked under considerable strain, and as a result the final product might not always be what was desired. In 1952 the Director of Housing Construction reported that shortage of skilled architectural staff “is handicapping research work and the production of improved designs.”²⁸ Three years later his division was still “under continual strain in endeavouring to carry out its functions satisfactorily.”²⁹ The Government Architect complained in 1957 that although staff turnover had been high and the volume of work had “increased to a remarkable degree”, the number of professional staff had remained static over the previous 5 years. As a result his staff had been “working under stress to the extent that I am concerned for the future efficiency of the division. I am also concerned for their personal well-being . . .”³⁰ The Commissioner of Works frequently pointed out the dangers inherent in such a situation:

“With the Department either controlling or influencing a very high proportion of the construction industry, it will be apparent that both output and safety depend upon the adequacy of the Department’s design and construction supervision.”³¹

In 1958 he went so far as to claim that there were “clear indications that rather more work was undertaken by both local authorities and Central Government than could be carried out in an entirely satisfactory manner.”³² By 1962 the situation still showed no improvement.

"It is disturbing to find at this stage of our growth, that in almost every field of building and development orderly planning and construction of works are impeded and, in some cases, crippled by shortages of staff."³³

In the 1950s and 1960s there was admittedly a world-wide shortage of the skills required by the Ministry of Works, but there were also features of employment in the New Zealand public service which limited the department's ability to recruit, and perhaps more importantly, to retain staff. Salary restrictions were obviously one factor. Some improvements were made in the mid sixties after recommendations from the Advisory Committee on Higher Salaries in the Public Service, although the value of these was undermined by New Zealand's lack of parity with the United Kingdom and Australia in categories of staff that were in world demand. However, the department felt that money alone was not the problem. It complained of being hampered by not being able to deploy its senior staff "entirely on efficiency":

"The Department has not only to establish all senior staff movements with the Public Service Commission but the Commission may then have to withstand appeals before an Appeal Board. Frequently the Department is unable to make appointments which are clearly in the best interests of departmental efficiency because of this system, which makes it possible for appointments to be upset even after they have been thoroughly investigated and approved by both the Commission and the Department."³⁴

Associated with this was another limiting factor—the State Service insistence on the grading of jobs rather than of people:

"Unless a precisely tailored position is vacant at the time, it is extremely difficult to give promotion to even an outstandingly able man. This state of affairs must eventually weaken the service, at least in its technical departments. One effect is that when a new and demanding job does occur the right man is not available and the wrong man often is."³⁵

Another feature of public service employment is the practice of moving from one department to another as a means of promotion. The Ministry of Works argued that because of the wide range of work it undertakes "the particular kind of experience required by its executive staff cannot be obtained readily by officers who move from Department to Department. . . ."³⁶

Apart from trying to persuade the State Services Commission to drastically alter the terms of employment of professional staff (in which field the department has persevered, though with only minor success)* the Ministry of Works has attempted to compensate for staff shortages in two ways—by recruiting overseas and by offering more work to private contractors and consultants. For reasons already explained the former method was of limited value. In 1962 the Commissioner of Works pointed out that although "The position has just been held over the last decade by recruitment of additional

*For example, lengthy submissions concerning shortages of staff were made to the Royal Commission on New Zealand State Services.

staff from overseas. . . . this source has never been lucrative and present indications are that it is drying up.”³⁷

Opening up increasing quantities of work to public tender created almost as many problems as it solved. Some construction work had always been undertaken by contractors mainly in the building and housing fields and to some extent in that of roading. National Party policy was to extend the area of work available to contractors and to open up design and planning activities to private architects and consulting engineers, always of course under Ministry of Works supervision. The difference between Labour and National was really one of emphasis. Semple himself had ordered that as much work as practical be available to the private sector—where everything else was equal then the job should go to a contractor. However, National policy was to use the private sector even when the results were not equal, and in the fifties this proved more often than not to be the case.

Throughout the fifties departmental reports implied that private firms were used for design and planning only when the Ministry of Works could not handle the work because of staff shortages. Yet if such was the case it simply contributed to the creation of a vicious circle because as one Commissioner of Works himself pointed out, “the use of private consultants tends towards the loss of further staff to such private firms, . . .”³⁸ And as the Government Architect pointed out “the commissioning of private firms does not release the Ministry of Works from this volume of work. The consultation with client Departments to formulate a brief still has to be undertaken by this Department to ensure a measure of control.”³⁹ The Commissioner of Works was even more explicit when he stated that “there is an erroneous belief that the performance of work by contract relieves the Department of a great deal of supervision and administration that would otherwise be necessary. Actually any savings of this nature are offset by the need to provide more detailed contract plans, clerks of works and inspectors, the legal documents necessary to ensure control and associated services.”⁴⁰

However, while the National Government may well have been prepared to accept that there were limits to the amount of design and planning which could effectively be carried out by the private sector, it was less willing to acknowledge limitations on the amount of construction work undertaken by contractors. Goosman believed the department’s own labour force should be minimal and reserved for maintenance work. Yet in the fifties there was little real competition for public works contracts, costs were usually higher than when work was undertaken by the Department itself, and standards were not always satisfactory*. In 1955 the Commissioner of Works was unequivocal in his assessment of the situation:

“... the contract field is not a healthy one so far as the Department is concerned. Almost 50 per cent of tendering for contracts was abortive and

*Historian K. Sinclair, commenting on the Government between 1950 and 1957 wrote that “after eight years of National rule, years of great prosperity, New Zealand was not noticeably nearer to free enterprise; the benefits of competition were not much in evidence, at least not to the average citizen.” (Sinclair, K., *A History of New Zealand*, Penguin Books 1969, p. 292). It is a comment which could be applied equally well to the public works policy as it could to the economy generally.

upon many occasions the Department found it necessary to negotiate firm prices. It was not uncommon, where more than one tender was received, for these to spread over a wide price range, indicating a lack of real competition. . . . It is unfortunately true that the standards of workmanship provided under the contract system have in some instances become lower than was formerly the case, and because of this the Department carried out a good deal of structural steel fabrication in its own workshops in the past twelve months, such work being completed at a favourable cost and to a high standard. In addition, concrete bridges in Auckland district were constructed by direct labour and it is many years since the Department has had concrete structures finished to such a good standard. Costs were more than competitive.”⁴¹

Two years later he reiterated this view and emphasised that “the Department must engage continuously in the direct-labour field side by side with contract work as a check both to costs and construction delays, and as a means of training officers for essential State construction.”⁴²

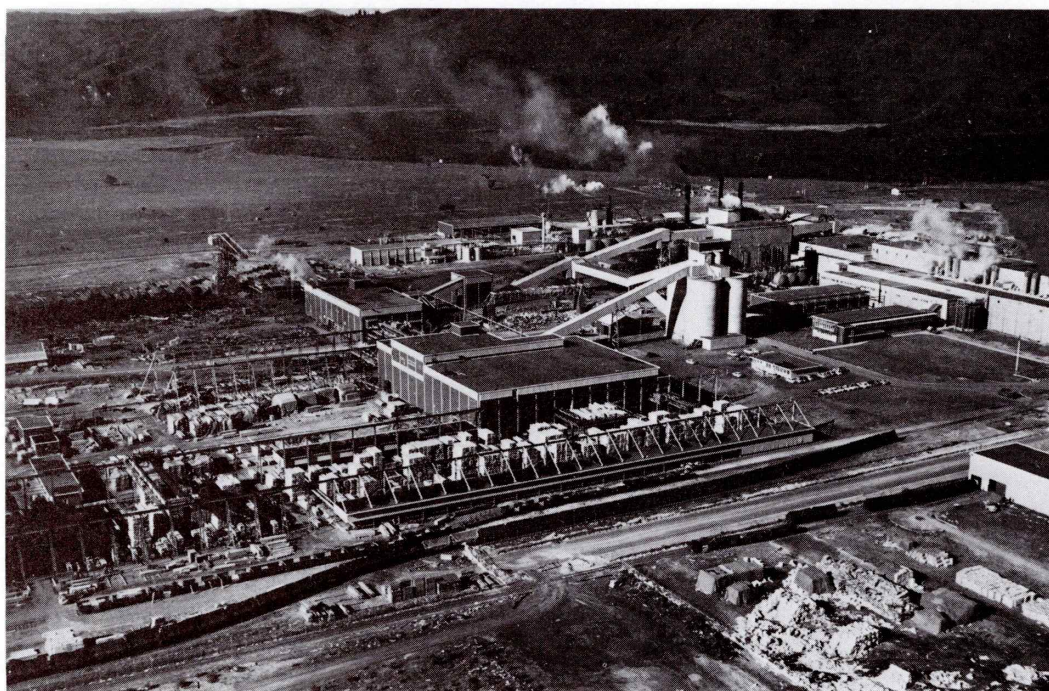
It was perhaps to be expected that with the apparently conflicting interests of the department and the contractors relations between the two would on occasion be strained. Something of this came through at the 1953 conference of the New Zealand Institution of Engineers. Two contractors presented a paper on “Engineering from the Contractor’s Viewpoint” in which they criticised the activities of the resident engineer and his staff—their complaints were directed not solely at Ministry of Works staff but also at the local bodies’ officers. Opinion at the conference was divided. Some agreed with a Christchurch engineer who claimed that “he had never in the whole of his career devoted so much time and energy to anything as to the direct assistance and necessary education of contractors, who often did not possess the trained staff capable of carrying out the engineer’s designs and wishes.”⁴³ Others, however, supported the view that “the public service was generally not keen to encourage a broadminded outlook or a spirit of co-operation.”⁴⁴ By the sixties many of these difficulties had sorted themselves out. The contracting industry had matured and developed. With regard to roading, for example, the director of the division acknowledged that: “The General Contractors Federation has become well established, . . . it has shown great willingness to improve the knowledge of its members and consequently the quality of their work*.” His comments could by 1960 be legitimately applied in all fields of contracting, though the competitiveness of the industry still fluctuated according to economic conditions. By 1961, of work carried out by the Roothing Division, approximately 90 percent of road sealing was done by contractors and it was estimated that between 55 and 70 percent of earthworking and general formation work was similarly contracted out. Virtually all road-metal supply was by contract.⁴⁵ In the year ending March

*He did note that there were still some unsatisfactory features namely “the disregard by quite a number of firms of their obligations to finish on time and lack of attention to the convenience of the travelling public.” (*AJHR*, 1961, D. 1, p. 39.)

1970 about 85 percent of buildings and 65 percent of all engineering works were carried out for the department by contract. The department has remained uneasy at the growing amount of work being done by contract and the National Government found it necessary to reassure it from time to time, as in 1962 when Minister Goosman noted that "Through the years there has been a slow but steady increase in the proportion of work done on contract. This increase will continue but it is considered to be in the best interests of New Zealand in its present state of development that a strong Government construction force be maintained."⁴⁶ However, it is clear from an address by his successor to the portfolio, P. B. Allen, to the Wellington Branch of the New Zealand Institution of Engineers in 1971 that his Government saw the future role of the Ministry of Works as one of planning, co-ordination, and supervision rather than construction.⁴⁷ Labour's policy on this subject was summarised by the Member for Roskill, A. Faulkner, when he said "The Ministry of Works had demonstrated its capacity to carry out great State undertakings. . . . In recent years, however, there had been a tendency on the part of the department to farm out work to private enterprise, whereas it should be the policy of the Government to build a great Ministry of Works capable of carrying out the civil and other projects required for the development of the country."⁴⁸

As an example of the Ministry of Work's abilities he instanced the development of the Tauranga – Mt. Maunganui harbour facilities. The department could be justly proud of the part it played in enabling the successful establishment of the Tasman Pulp and Paper Company. The work undertaken for the project included the construction of a pulp and paper mill; 30 miles of railway from Murupara to the mill site at Kawerau; a rail link of approximately 6 miles from Kawerau to Awakaponga on the East Coast railway; restoration of the rail link between the East Coast railway and the new port at Mt. Maunganui; the erection of a high-tension transmission line from Arapuni to Edgecumbe; extensive marshalling yards and log-handling facilities at Murupara and Kawerau; substantial wharf construction at Mt. Maunganui; extensive storage and rail facilities to service the port; and two considerable townships at Murupara and Kawerau.⁴⁹ It was achievements such as these which assured the department that it could compete successfully with private enterprise and which led it to reject some of the findings of the Commission of Inquiry into the Kaimai Tunnel disaster which implied otherwise.⁵⁰

The 1950s saw not only the increased use of local contractors but also the reintroduction of overseas firms to New Zealand public works. It was in the field of hydro-electric development that the move was first felt necessary. Towards the end of 1949 an American consultant, Dr J. L. Savage, D.Sc. was brought to New Zealand to "report generally on the Hydro Electric Construction Programme in hand and envisaged in the immediate future."⁵¹



The Kawerau mills, photographed in 1958, are operated by the Tasman Pulp and Paper Company. The Ministry of Works was closely involved in their construction. *National Publicity Studios.*

He substantially endorsed the work of those concerned in the design and construction of the power schemes and compared it favourably with the best overseas practice. One point he emphasised that “every effort should be made to consummate early arrangements for utilising large-capacity construction plant on a scale that is necessary for expeditious and economic project construction.”⁵² He suggested four possible ways of doing this: the State buying the necessary plant and using a Government work force; arranging local contracts with completion dates that would necessitate use of large-capacity construction plant; combine local and overseas firms; or employ foreign firms with the necessary plant. He favoured the last two alternatives. The Commissioner of Works, however, believed that the opening up of major hydro works to overseas tender “must depend upon the overtaking of the arrears of design with which we are still faced, in order that the requisite plans and specifications may be available.”⁵³ As has already been noted the shortage of design staff was critical and was further aggravated by a continuing loss of staff to the Snowy Mountains project in Australia.⁵⁴ Although the original suggestion had only been to use overseas construction forces, in 1951 Goosman announced that because departmental design staff “cannot meet the need to extend our hydro-electric development to

cope with the rapidly increasing demand", the Government had decided to engage experienced overseas engineering consultants to prepare detailed designs for the proposed schemes at Atiamuri and Ohakuri.⁵⁵ The firms appointed were Sir Alexander Gibb and Partners and Messrs Merz and McLellan, both of London.⁵⁶

At the same time in order to expedite projects already under way it was decided to try to induce overseas contractors to come to New Zealand with their own staff and labour.⁵⁷ The hydro scheme at Roxburgh was to be the first so completed. This particular attempt to reintroduce foreign firms to New Zealand's public works proved far from satisfactory. The Minister somewhat euphemistically ascribed the problems to "the initial difficulties experienced by these contractors in establishing themselves."⁵⁸ The work was contracted to highly reputable European firms, Holland & Hannen and Cubitts Ltd. (of London) and Conrad Zschokke, S.A. (of Switzerland). During their first 12 months of operation Ministry of Works inspection staff repeatedly had to comment adversely on the quality control methods used, the apparent inability to control costs, and the poor progress made on the work.⁵⁹ The basic problem was lack of skilled personnel. Despite their overseas contacts Cubitts and Zschokke proved no more capable of attracting the necessary staff to New Zealand than the Ministry of Works had been. The Commissioner of Works, in a cable to the firm's British principals, summarised the position when he pointed out that: "Labour materials plant all available full construction operations but overall works organisation and administration remains ineffective."⁶⁰ In August 1953 the project engineer applied for additional inspection staff to avoid poor work going undetected;⁶¹ and various attempts were made to get the contractors to supply suitably qualified staff for the job. Not surprisingly there was some tension between Ministry of Works and contracting staff.⁶² When the department eventually recommended that the contract be taken out of their hands,⁶³ the contractors gave as one of the reasons for their failure "lack of co-operation on the part of the Ministry's Engineers on the spot."⁶⁴ However, an examination of the various areas of weakness in their operations showed conclusively that lack of skilled knowledgeable personnel was the crucial factor—which is somewhat ironical in view of the stated reasons for employing overseas concerns. Eventually an arrangement was made for the introduction of a local New Zealand company to work in conjunction with Cubitts and Zschokke and to supply acceptable personnel in the important supervisory positions.

Later use of overseas contractors on hydro projects was to be more successful, although cost escalation in the 1960s on the Manapouri project which was undertaken by an American consortium reopened the question of the advantages of the involvement of overseas interests in public works. There were some, for example Dr W. B. Sutch, who felt that the use of foreign

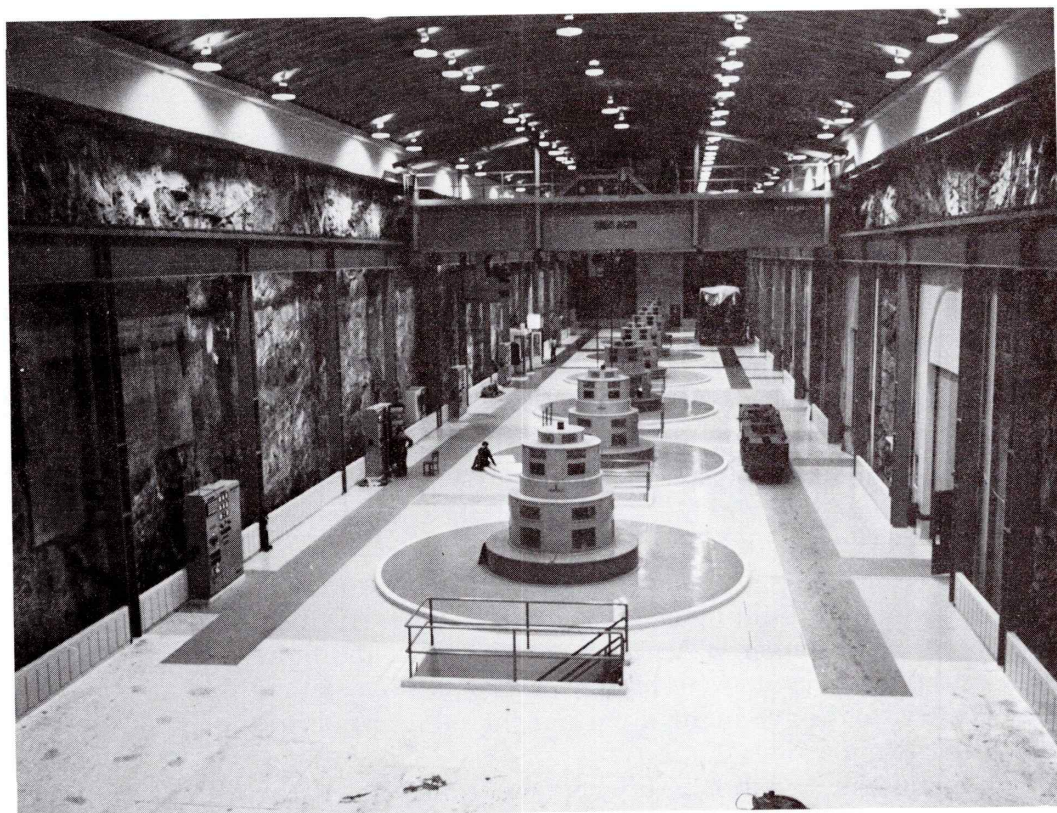


Part of the largest single power development in New Zealand, the powerhouse at Lake Manapouri is some 700 ft below the surface of the lake. As seen here in September 1967 the excavation for it is practically complete. *Bechtel Pacific Corporation. Ministry of Works.*

concerns on any significant scale involved a substantial threat to New Zealand's independence of action in economic affairs and general development.⁶⁵

From the department's point of view there were very real disadvantages in having any great amount of design work done outside the country. As the Commissioner of Works said in 1964, "Work to a value of some £80 [\$160] million is at present being designed overseas. The cost of this is considerably higher than the recorded cost of similar work done internally. In addition it involves overseas funds and, worst of all, it does not create and retain 'know-how' in our own country."⁶⁶

Overseas contractors were brought into another field in the early fifties—that of tunnelling. Though they pierced the Rimutaka Tunnel for the Rimutaka railway deviation more than a year ahead of schedule there was some disagreement amongst engineers in New Zealand as to the extent of



General view of the completed machine hall at Manapouri. Note the uncovered panels of natural rock. August 1971. *Bechtel Pacific Corporation. Ministry of Works.*

the contractors contribution to the success of the venture. It was in fact a joint American – New Zealand venture made up of the Morrison-Knudsen-Downer companies.

An editorial note in *New Zealand Engineering* called it “a remarkable achievement” and went on to say that: “The piercing of the Rimutaka tunnel . . ., more than a year ahead of schedule, must rank as an outstanding New Zealand engineering achievement.” It acknowledged the role both of Ministry of Works and the contractors: “Much credit is due to both the Ministry of Works, who drove the initial 1,400 ft, and to the main contractors, Morrison-Knudsen-Downer . . . and the adoption of the Swedish method of tunnelling by the contractors was a significant factor in achieving the high speed of completion.”⁶⁷ The following year at a New Zealand Institution of Engineers conference discussion on the deviation, F. M. H. Hanson commented:

“Much of the credit for the Rimutaka tunnel had been given to the contractors. The latter deserved credit for introducing a few new techniques

and pushing on with the job, but New Zealand engineers conceived the tunnel, designed it, and supervised the construction, and would carry the responsibility for it.”⁶⁸

Another participant argued that if the tunnelling had been done by New Zealand’s own forces the progress might have been slightly slower but it would also have been cheaper, and he wondered whether after waiting 90 years from the time a tunnel was first mooted in 1858 to 1948 when the first effective shot was fired, a few months more delay really would have made any difference.⁶⁹ G. P. Keller, who was a Ministry of Works engineer on the job, gave his view:

“No one who had been close to the job had any doubts about the quality of the work. Admittedly the contractor, in his ordering of the operations, went for speed. It took a little while, but the contractor did alter the ideas of New Zealand engineers as to what must be taken as inevitable complements to ‘speed’ tunnelling, in the amount of shooting, kind of timbering, and the mount of overbreak.”⁷⁰

The New Zealand contractor on the job, A. F. Downer, went even further:

“The tunnel was built by New Zealanders under the direction and management of a small number of American experts, who did more, I would suggest, than introduce a few new techniques. They brought an entirely new look to the industry, and have made a permanent subscription to the art of tunnelling in this country.”⁷¹

The Rimutaka deviation as a whole was completed early in 1956, eliminating one of the most difficult lines of railway in the country.

Use of overseas contractors may have temporarily alleviated staffing difficulties but as has been already noted it added to rather than reduced the volume of supervisory and administrative work which the department had to do. Nevertheless in the fifties despite an increase in such work the percentage of overhead costs to gross expenditure actually declined. This was caused mainly by the fact that departmental staff did not increase in proportion to the increase in the volume of work. In the 8 years to 1954 the volume of work increased by 60 percent, but staff by only 33 percent.⁷² Other costs, however, mounted steadily. At the beginning of 1950 an analysis made by the department into the cost of house building showed that an average house had increased in cost between 1939 and 1950 by 75 percent—award wages had increased by 40 to 50 percent and improved conditions such as holidays and travelling further added to this figure; material costs had increased from between 60 and 300 percent.⁷³ The report commented that in other fields of construction the rise in costs had been even greater. What was not generally appreciated, however, was that the increase in costs was, as the Commissioner of Works explained, “very largely due to the standard of construction asked for by educational, health, and other authorities, . . .”⁷⁴ For an

only too brief period in the fifties—between 1955 and 1957—building costs actually steadied and even showed a slight downward trend. This coincided with the increased availability of tradesmen, the greater selection of materials and increased competition as the building industry developed.⁷⁵ Throughout the fifties expenditure on all areas of public works increased. The increases did not always appear sufficient to the department. In 1953 the Commissioner of Works reminded his Minister that while he appreciated “that expenditure on the works programme must be kept in balance with other demands on Government funds, but at the same time it must be pointed out that much of the programme consists of urgent developmental works and essential maintenance, the curtailment of which must have, in the long run, detrimental effects.”⁷⁶ Some members of the public, however, apparently felt that public works generally involved far too high an expenditure and should be cut back. When it came down to selecting specific projects for curtailment there was always a strong reaction against any suggestion of reduction be it in electric power development, telegraphic services, housing, land settlement, or educational buildings. During the sixties apparent expenditure showed a considerable increase*. Between 1959–60 and 1969–70 expenditure increased by 56 percent from \$89,864,650 to \$140,266,399. But when the earlier figure is adjusted to 1969–70 costs, it becomes \$129,763,662 giving an increased expenditure just over 8 percent. As the population during the decade grew by 19 percent this increase is certainly not excessive. This example illustrates the complexities involved when comparing figures over a period. Government policy was of course to determine public works expenditure according to economic circumstances and there were considerable fluctuations throughout the sixties as attempts were alternatively made to stabilise or stimulate the economy†.

The greatest expenditure throughout the 20 years under consideration was on housing, hydro-electric development, roading, and public buildings, but the proportions on each varied considerably. Housing, which in 1950–51 accounted for 47.7 percent, had dropped to 26.1 percent by 1960–61 and to 13.1 percent by 1970–71. Electricity generation increased from 23.5 percent to 31.7 and then to 34.5 percent. Roads and highways increased from 14.1 to 21.5 percent and then remained fairly static to finish at 23.1 percent. Public buildings from a modest 6.9 increased steadily to 15.3 percent and then more slowly to a final figure of 18.1 percent. These movements can be followed in the graph in appendix IV.

From 1935, when Labour won office and undertook extensive building of State houses, to 1949, when it lost power, attitudes to housing underwent some significant developments. As a Ministry of Works publication pointed out in 1949:

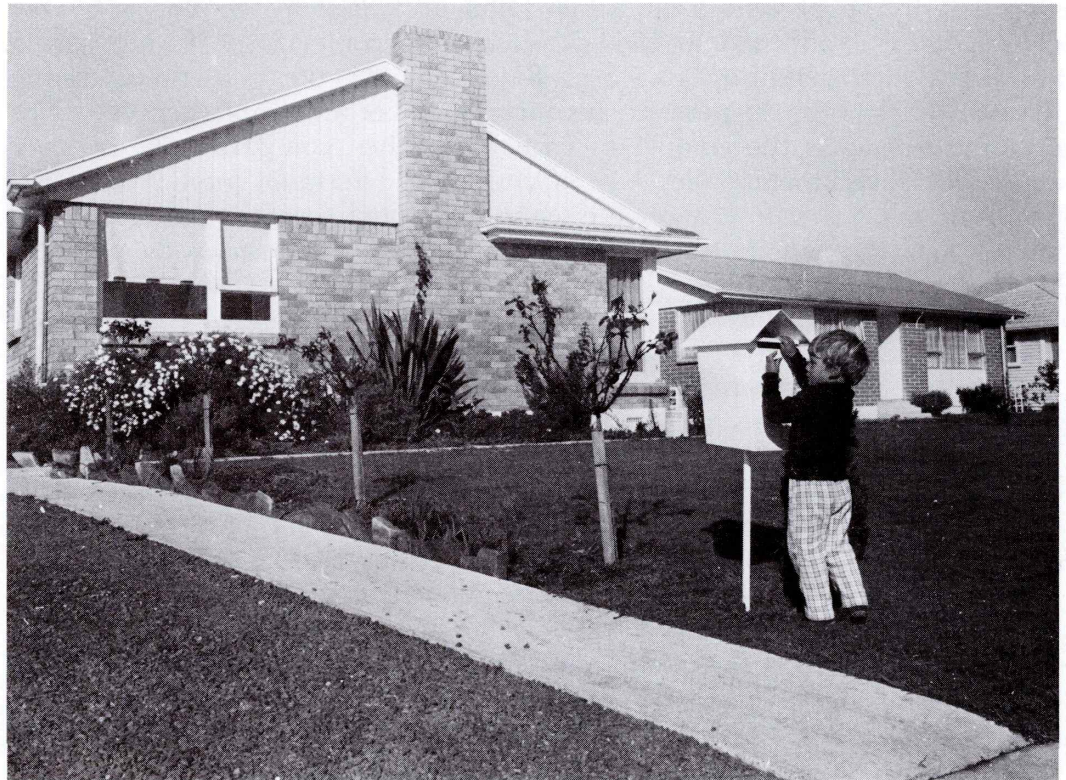
“Housing was to become a Public Utility, the right to live in a decent

*The figures which follow were taken from summaries prepared from published figures, but they will not necessarily equate exactly with figures found in the annual statements.

†As in the past the public works programme had still to be sensitive to the state of the labour market. In 1968 the programme for the year was designed to include a larger proportion than in the past of works which needed a high labour content. Scrupulously avoiding any mention of unemployment, Minister of Works Allen commented that “In this way it has been possible to absorb some of the labour which has become available.” (*AJHR*, 1968, D. 1, p. 3.)

dwelling being regarded as on the same level as the right to education, sanitation, to good and abundant water, to an adequate road system, and to a certain amount of medical care.”⁷⁷

The Labour Government instructed its Housing Construction Department that “the houses were not to be what are usually called ‘workers’ dwellings’; the aim . . . [was] the adequate provision of good new houses at least up to the standard of, and preferably better than, the houses inhabited by ordinary typical citizens. And in no circumstances were the same designs to be used to such an extent that they would be labelled as ‘Government mass-produced houses’.”⁷⁸ The housing situation which was acute before the war was gravely aggravated by it and it was only to be expected that the need to produce houses in quantity should outweigh other considerations. The serious shortage of skilled design and architectural staff which has already been noted in the early fifties further restricted new developments in housing constructed by the Housing Construction branch of the Ministry of Works (pages 180–82 for details of its absorption into Ministry of Works). Between 1950 and 1970



New look State housing, Bankwood, Hamilton. *Ministry of Works.*

the public became increasingly aware that adequate housing involved more than four weatherproof walls and a roof. Whereas in the late thirties the Housing Construction Department seemed to be just ahead of public opinion, by the 1960s the Housing Construction Division of the Ministry of Works seemed to be trailing well behind it.

A booklet published by the division in 1959 asserted rather blandly (but quite accurately) that: "The function of the Housing Division is to see that Government policy in respect of housing is implemented smoothly and efficiently."⁷⁹ Two factors certainly limit the responsibility of the Housing Construction Division for the type of State housing development that has taken place in the last 20 years. The first is the fact that successive National Governments have always accorded low priority to State housing. In 1952 for example while acknowledging that "Housing, both urban and rural, still continues to be an urgent and major problem", the Minister of Works announced that he would continue the policy of limiting the number of State rental houses let out to tender; so despite a continuing shortage there would be a reduction in the number of State rental houses built in a year*.⁸⁰ He put the emphasis on private housing and the division contributed by making sections in its developments available for sale. Combined with this attitude was the view that what State housing there was should be restricted to those at the bottom of the socio-economic scale and that any housing should befit their position. The Housing Construction Division is therefore limited in the scope and variation of its designs by the amount of money allocated to housing by the Government of the day and also by the fact that it has to construct to the basic requirements of its client department, the State Advances Corporation. Limitations arise because neither the State Advances Corporation nor the Housing Construction Division has overall responsibility and neither systematically collects the type of sociological data now widely recognised as essential in the successful creation of communities.

Major developments in housing in the fifties and sixties included the construction of whole new communities such as Porirua, Otara, and Tamaki; the erection of high rise flats; the growing emphasis on medium density housing; and the construction of entire townships usually in association with hydro-electric or other long-term construction projects. Multi-storey blocks of flats had been planned in the late forties and were erected in Wellington (the Dixon St. flats) and in Auckland (in Greys Avenue and Symonds Street) in the fifties. The real emphasis on medium and high density housing developed after 1957. That year the Commissioner of Works set out in some detail the advantages of such housing in urban development. In what proved to be an overly confident assumption that New Zealand would learn from overseas experience he noted that "References in this report to high-density flat accommodation are not intended to refer to the construction of vertical

*To supplement the number of houses available the Government decided to call for tenders for the importation of 1,000 prefabricated houses. The tenders were invited on the basis of contractors bringing to New Zealand not only the component parts of the houses, but also their own staffs and labour. (*AJHR*, 1952, D. 1, p. 3.) This despite the fact that the Director of Housing Construction had earlier stated that "Consideration has been given to many proposals for the importation of prefabricated houses, but in every instance it has been found on analysis that the final cost of such buildings erected in New Zealand is much greater than that of a similar sized State house constructed in the normal manner." (*AJHR*, 1950, D. 1, p. 101.)



A development in high density housing. The Gordon Wilson flats in Wellington. *Ministry of Works.*

flats in existing streets, but to the development of open, park-like areas in which all the amenities demanded by present living standards may be maintained.”⁸¹ In fact by the late sixties medium density housing (which comprises flats of up to but not exceeding three stories) accounted for 50 percent of all State housing.

It was given prominence in the new developments undertaken at places like Porirua. Porirua was typical of the areas opened up by the division once serviced land in cities and boroughs had been exhausted and there were no longer any sites accessible to extended municipal services. The policy then became to acquire large areas of undeveloped land. In some cases such as at Porirua the topography demanded extensive engineering works to create building sites. Development of such sites was made possible by massive earthmoving operations “resulting in very rugged land being converted into easy slopes suitable for building operations.”⁸² The Porirua Basin project was the largest undertaken. It was designed to produce 11,000 sections when completed in 1975—many of which were made available to private builders

and developers. The other large schemes at Tamaki, Otara, and Mangere were intended to have 4,000 to 5,000 home sites, each with a proportion of State rental and private houses.⁸³ Somehow these housing projects failed to live up to expectations. Porirua was described by Victoria University's professor of sociology, Dr J. H. Robb, as the most "crashing failure" of any State housing area in New Zealand, and far from contradicting him the then assistant director of housing, F. C. Basire, acknowledged the problems in the area and said that a sociologist was now working within the State Housing Division. That was in 1969. Robb rightly pointed out that he was concerned "that it is only within the last year that work has been going on in the departments. Even now it is on a shoestring level . . ."⁸⁴ His concern could not have been more accurate. In the Housing Construction Division two extremely enlightening studies were undertaken by P. J. Melser and J. R. Daish. The first was *A Case Study of Twenty State Houses and Families*, and the second *A Study of Medium Density Housing*. They were undertaken to determine how well the ideas of the designers reflected the way people who lived in the houses actually wanted to live.⁸⁵ It seems incredible that no systematic information to answer this question existed in New Zealand prior to 1969. Comments were invited both on the house or flat and on its surroundings and the amenities available or considered necessary in such developments. The studies showed that very little was known of the requirements of families at different stages of development and therefore their needs were not being catered for, although on occasion only minor modifications would be necessary to considerably improve the comfort of the occupants*. Two general points emerged very strongly. Firstly, although ample provision, in terms of areas set aside, was made for community facilities, these when they did actually exist were frequently a considerable distance from the living areas and this fact was aggravated by poor transport facilities. Secondly, it was apparent that more importance should be attached to the development of the sites surrounding the living units. The study of medium density housing noted that: "Respondents regard this outside space as very important while the Division tends to overemphasise the importance of the living unit at the expense of the outside space and the relationship of the living unit to this outside space."⁸⁶ Yet as if to emphasise the seriousness of the high staff turnover both men who conducted these studies had left the Ministry of Works before they were able to produce new designs and ideas based on them. Shortage of staff prevented them from being followed up. As long as the division remains primarily the construction agent for State Advances then it is clear that money for such research will always be minimal. There is a strong case to be made for a single department with complete control for housing policy and construction rather than the present emaciated divisions, where one is concerned with the economics of housing, the other with the

*Some random examples taken from the studies show the type of improvement long overdue:

"Although single bedrooms had sufficient space for the furniture of one person the overall size of the room seems too small for comfortable use by one person. It would seem that even for the sleeping-dressing function of bedrooms some increase in space would be desirable." (*A Study of Medium Density Housing*, p. 42.)

"Many respondents felt that the backyard paths are uncomfortably narrow. While prams and tricycles do fit on, they slide off easily while being moved. This could probably be resolved by increasing the width of paths by from three to six inches." (*Ibid.*, p. 55.)

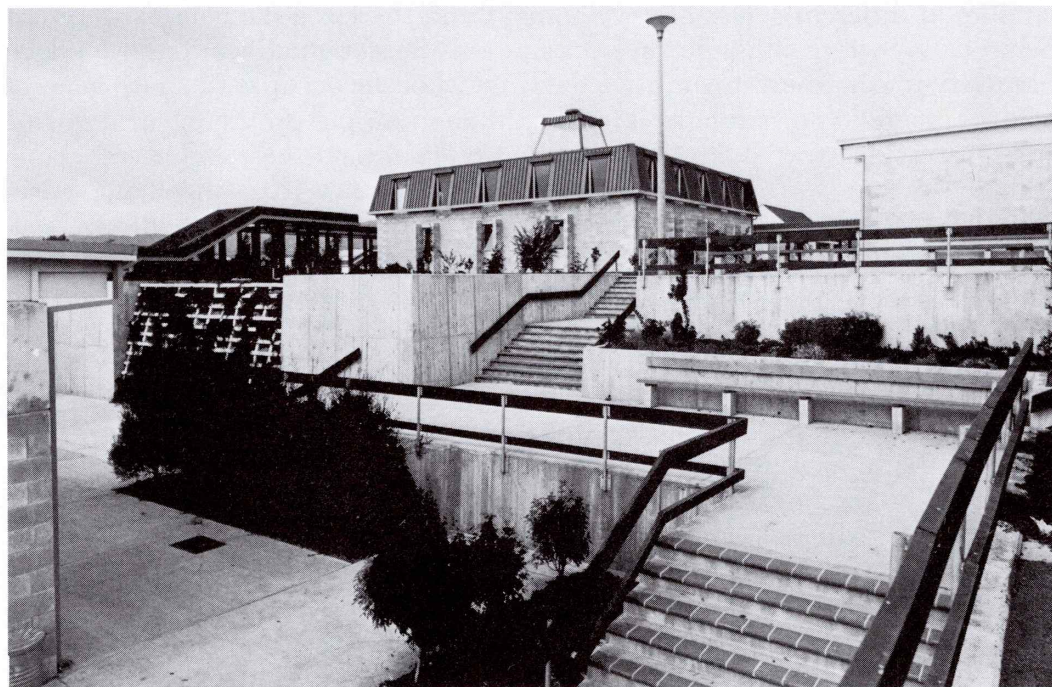
"It was observed that a space for the refrigerator which did not diminish the bench space or encroach on the dining space, was seldom provided." (*A Case Study of Twenty State Houses and Families*, p. 6.) The poor quality wallpaper used caused considerable tension. (See *Ibid.*, p. 11.)

physical requirements of construction, and neither has the staff, time or money to be concerned with the social implications or effects of its work. It should be noted, however, that State housing is no worse in design or concept than low-cost or indeed medium cost developments undertaken by private concerns, and in some cases it is considerably better. In an article in the *Evening Post* at the end of the fifties artist Peter McIntyre despaired of New Zealand architecture:

“Has this country as yet developed an architecture of its own? Is there such a thing as ‘the New Zealand house’?”

Looking at our city of Wellington I would say, definitely, no: unless perhaps it is that monstrosity of builders’ architecture, the ‘two bay windows, front door in the middle’ house that blighted our landscape for half a century. The average New Zealand house of today bids fair to carry on that tradition, and unless something is done about it our beautiful New Zealand is going to be made abysmally ugly by a vast creeping, angry, slum-producing wooden rash.”⁸⁷

New Zealand’s failure of architectural taste was attributed by one writer to “The public’s conviction was that if you wanted a building you went to a builder and he built it. Just that. As a recently pioneered country, such a thing as an architect was a strange animal to be viewed with suspicion.”⁸⁸



Library block, Rotorua Lake High School. Completed 1972. *Ministry of Works*.

The Government Architect during the fifties was Francis Gordon Wilson who has since been widely acclaimed as one of the most progressive architects of his day. He designed the Dixon Street flats and encouraged high density development in urban areas. A colleague after his death wrote:

"Office buildings, schools, hospitals, post offices, flats and hotels flowed from the Ministry of Works, free of inhibitions and expressing the best thoughts of contemporary design. Of course, Gordon would not have claimed that he was personally responsible for all of each design, but he was the man behind the gun who inspired and guided the arm, . . ." ⁸⁹

Another commented that "to many young architects he was the arbiter of 'contemporary design.'" ⁹⁰ He had been Chief Architect for the Housing Construction Department during its most successful period*, but as Government Architect he was more concerned with public buildings than housing with the exception of the high density flats which were his special interest. Certainly a concern for design and an awareness of aesthetics which seems completely absent from those of his predecessors, comes through his annual reports. He obviously saw his role partly as that of an educator of public opinion. In his first report he announced "In all the work of the Architectural Division a new and liberal concept in the use of colour is being explored. Bold colour schemes, internal and external, have been incorporated in such buildings as the new major post-primary schools. Good colour painting costs no more than poor painting." ⁹¹ After an overseas trip he urged that more consideration be given to site development and tree planting than was customary in New Zealand and he cited European examples of trees up to 20 and 30 ft high being transplanted to the grounds of public buildings. ⁹² He deplored the New Zealand tendency to replace the old with the new, irrespective of the soundness of the old and urged instead the reconditioning of many of the older buildings. ⁹³ He succinctly defined the basic problems associated with the design of major public buildings:

"For public buildings the design problem is wider than a strictly functional one. Mostly they are permanent buildings, prominently sited, which the community use often. They form the nucleus of any town and as such they should be the best of the period in which they are built. They should not be extravagant or flamboyant, but efficient and of good quality, designed to suit their environment." ⁹⁴

Although during his term of office the use of standard plans and designs increased he was well aware of their limitations:

"So long as a rigid standard is adopted, modifications must be limited to those practicable within the original design. Apart from this, adherence to a standard often means that insufficient account is taken of variations arising out of locality and orientation and the modifications which can be made are not always satisfactory. However, standard plans do mean that

*Working under him during that period was one of New Zealand's greatest architects, E. A. Plishke. In other circumstances his influence might have been decisive but the strong personality of Gordon Wilson prevented this. From what one knows of Plishke's work, and despite Gordon Wilson's own undoubted talent, it is a pity this was so. For example Plishke's original design for the Naenae shopping centre was claimed to be immensely superior to the final product. As one report described it:

"His layout for Naenae was a beautiful scheme—and practical as well as beautiful. Its shopping courts were enclosed for shelter, unlike the open wind-tunnel of the present scheme. The buildings were unified and not the disjointed blocks they are today. There was ample parking everywhere. The local shopkeepers would not have complained, as they do today, about a parking problem." (*Dominion*, 6 April 1963, p. 10.)

He even provided an outdoor and indoor nursery for children while mothers shopped. Like most of the good things about his design, it was wiped.



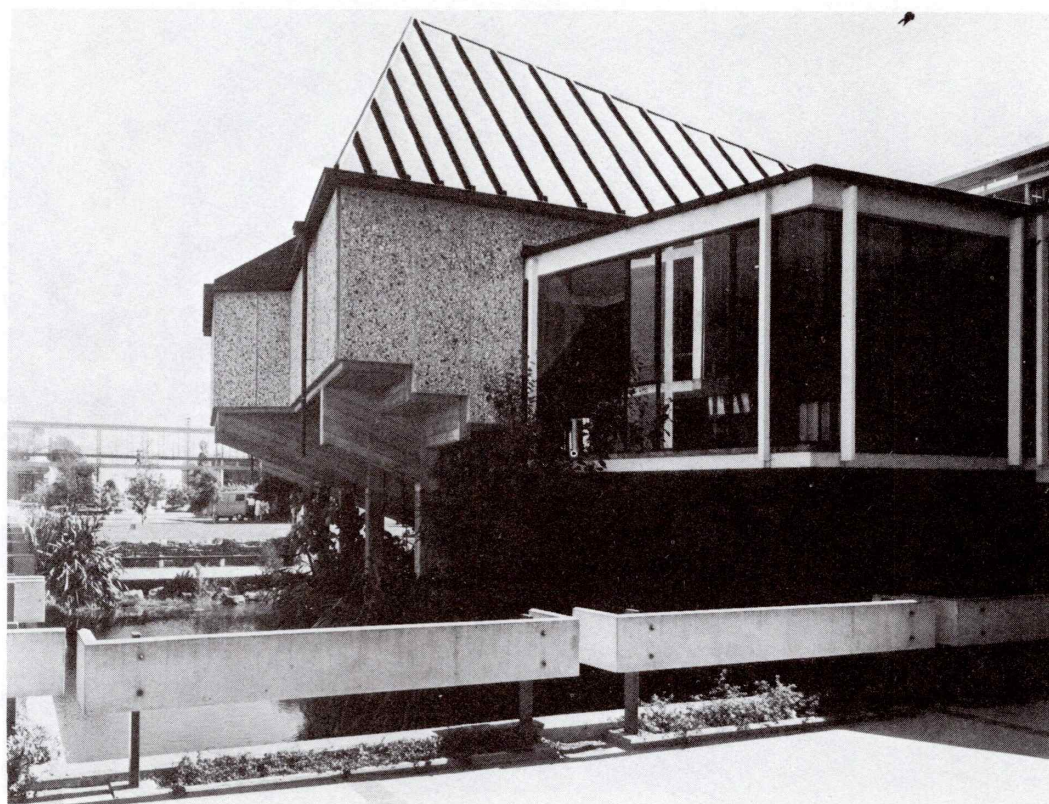
Main postal headquarters, Wellington, viewed from the south. Completed 1971. *Ministry of Works.*



Canterbury University School of Engineering, Ilam. The "Circular" lecture theatre seating 180 was completed in 1960. *Ministry of Works*.

more buildings can be built; but when design staff are overtaxed, as at present, the system tends to be abused."⁹⁵

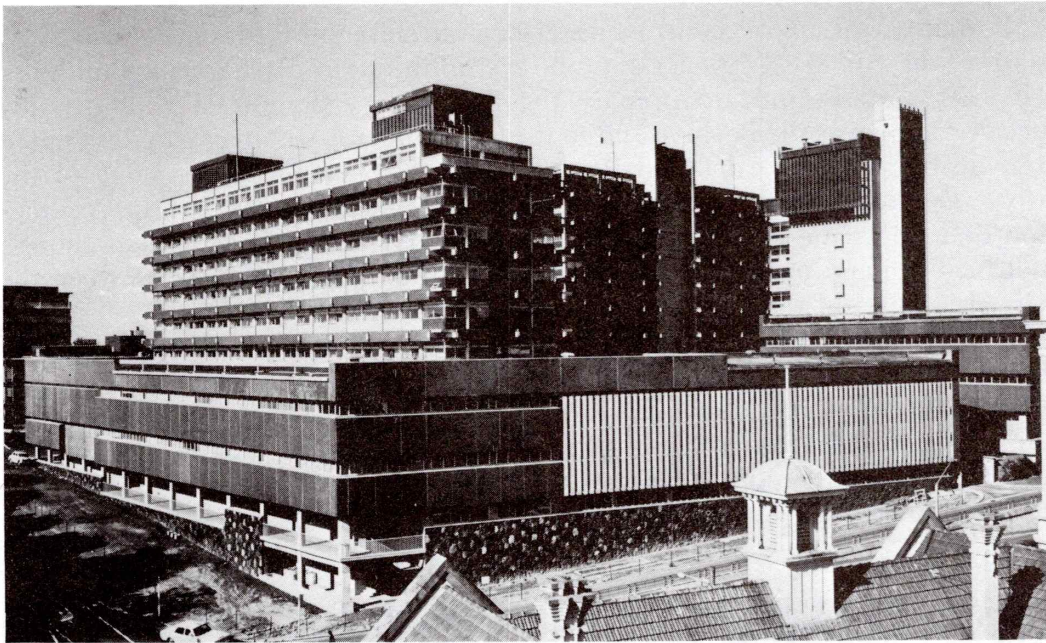
The need for new Government departmental buildings was acute by 1950—the functions of Government had considerably expanded since 1939. Nor was the demand simply for administrative offices. In 1955 the Commissioner of Works pointed out that "in almost every locality there exists a need for education buildings, hospitals, post offices, telephone exchanges, and similar public utilities."⁹⁶ Yet the department could only programme for buildings with the most pressing priorities because: "With the steady conversion of a greater proportion of the building potential to private housing and to the industrial and commercial needs of private interests, the difficulty of completing public buildings has been accentuated."⁹⁷ Under the short-lived Labour Government of 1957–60, however, public buildings began to receive a greater share of the country's construction capacity and this continued into the sixties, particularly in the fields of university buildings, hospitals, and State offices. In all these categories there were buildings with complex



Canterbury University School of Engineering, Ilam. These two lecture theatres seating 150 and 250 respectively were completed in 1967. *Ministry of Works.*

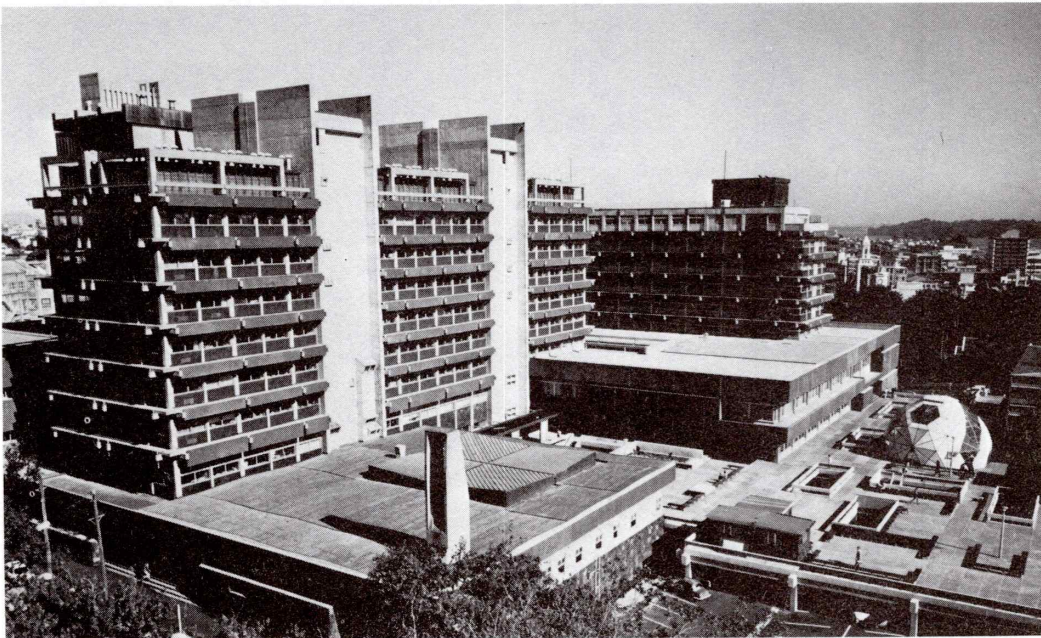
technical problems of a type that had not previously been encountered in New Zealand. Building design ceased to be the preserve of architects, if indeed it had ever been; successful construction now depended on the co-ordination of the various specialists in heating, ventilation, lighting, electrical, mechanical, and structural engineering.

Broadcasting House in Wellington, for example, presented unique problems. It required eight air-conditioning and two ventilating plants, which constituted the largest installation of air conditioning equipment ever made in New Zealand up to 1960. A special feature of the installation was the many thousands of feet of large steel ducting specially arranged and treated to achieve the very low noise level requirements of modern broadcasting.⁹⁸ Another building with special requirements was the Government Printing Office in Thorndon. In the Auckland Hospital acute block, on which work began in 1965, mechanical and electrical services were estimated at one-third of the overall cost of the block.⁹⁹



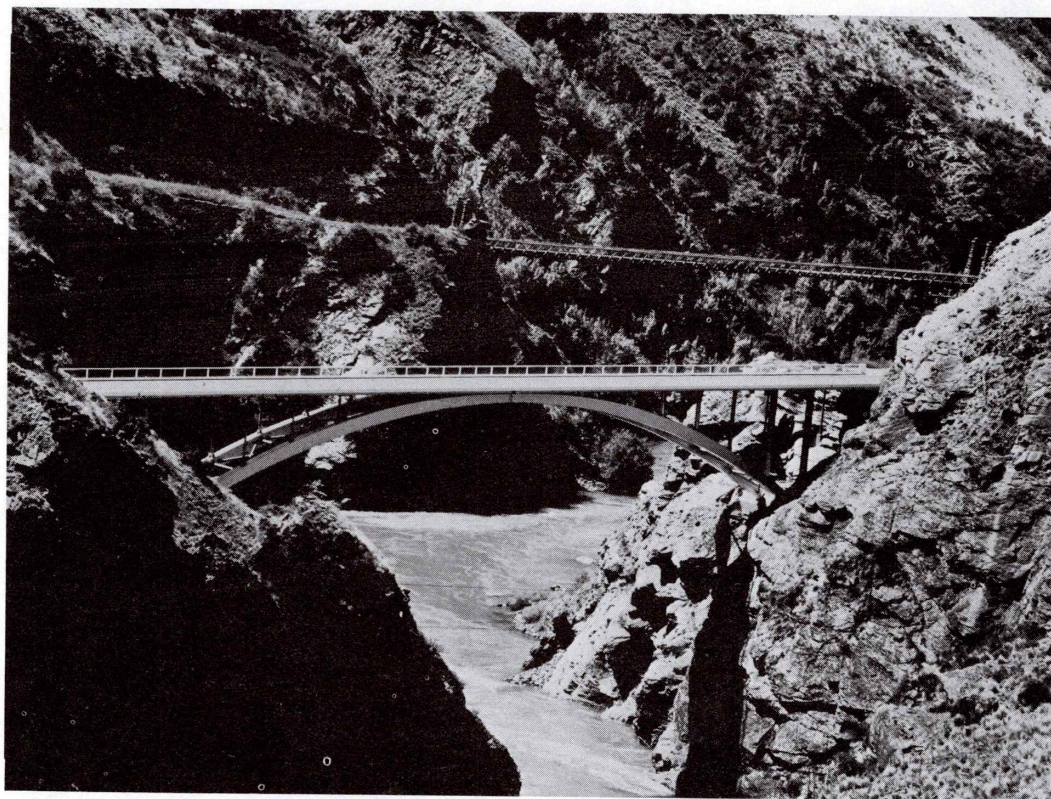
Physics and chemistry portions of the University of Auckland buildings complex. *Ministry of Works.*

Part of the University of Auckland buildings, with the chemistry block, completed in 1967, to the left and the physics section on the right. *Ministry of Works.*



Probably the most controversial local architectural design during the sixties was Sir Basil Spence's proposed addition to Parliament Buildings. He was commissioned to prepare the preliminary designs of what rapidly became known as the Beehive and to the Government Architect was designated responsibility for the detailed designs and supervision of each stage of the work. By the end of the Ministry of Work's first century the area in Wellington defined as the Government Centre was well under development though not before many problems and differences of opinion had arisen between the Government and the City Corporation.

Both housing and public buildings were chronically short of finance, but in one area of public works the Government ensured a steady and regular income—for roading. The National Roads Act 1953, which came into effect on 1 April 1954, instituted sweeping changes in roading administration, not the least being the constitution of the National Roads Board. Fundamental to the changes was the method of financing. Provision was made for automatic



Kawarau River bridges near Gibbston on the Cromwell Queenstown State Highway; in background the old bridge erected in 1880, nearer the steel arch bridge opened in 1963. *Ministry of Works.*



The Mohaka River is deeply entrenched and both railway and highway crossings call for major structures. This one, completed by 1963, is between Napier and Taupo. *Ministry of Works.*

payment into the National Roads Fund of all motor-spirit tax, heavy traffic fees, tyre duty, and an annual payment from the Consolidated Fund of £1 million (\$2 million).¹⁰⁰ The Ministry of Works was to continue to service the activities of the board, to be responsible for all State highways design, construction, maintenance, and the overall administration of main highways under the control of local bodies.¹⁰¹ In 1959 it was agreed that a Roothing Division of the Ministry of Works should be developed to meet more effectively the requirements of the National Roads Board. The division was established in 1960 with a head office staff of 17 which included a Director of Roothing, an assistant director, a secretary, and 5 clerical officers, a programming engineer assisted by a research officer and a senior engineer, a highways engineer for design and location with 2 younger engineers, and a highways engineer for design of pavements with 1 junior and 1 senior engineer. In the following years modifications were made for the efficient functioning of the division including the appointment of district highways engineers to all

districts and the assignation of an inspecting engineer to the division where he would be directly responsible to the Director.¹⁰² In 1964 a maintenance engineer was appointed to advise districts on practices and techniques and generally to co-ordinate maintenance work on State highways.

The need for some change in roading administration, which with the Main Highways Board had remained virtually unchanged for 30 years, was undeniable. Changes were based on five main factors:

- (a) The Main Highways Board was charged only with the responsibility for the State and main highway system. For the remaining 38,000 miles of road in the country there was no central authority to advise and assist the various roading authorities in establishing a satisfactory overall roading system.
- (b) There were administrative difficulties in assisting the financially weaker local authorities in maintaining and improving the roading in their respective areas. The only effective means of doing this was to declare roads in needy districts to be main highways, entitling them to preferential subsidy. This led to anomalies with assistance going continually to some areas of development at the expense of others, and necessary new works were being held up because of the commitment of funds to highways which in fact were not an integral part of the national highway network.
- (c) There was a need for an increased, independent, and assured source of finance for roading development, to enable continuity of programming and advanced planning to be instituted. With annual appropriations by Parliament, there was an element of uncertainty which deterred local body initiative. There was no fixed date for announcing the funds available for various works and variations both as to timing and amounts occurred from year to year. Roading bodies were therefore compelled to await the announcement of the appropriations each year before committing themselves to extensions of maintenance and construction programmes.
- (d) The traffic and transport problems both within and on the outskirts of major urban areas were becoming serious.
- (e) There was an evident need for a Board with wider representation to bring to bear on roading matters the widest possible background of knowledge and experience.¹⁰³

As a result of these problems and the backlog of work from the war period New Zealand's roads were in bad shape at the beginning of the fifties. A newspaper report in 1948 asserted that there was a real threat to the Dominion's economy through failure of roads built on clay and silt foundations and general road deterioration through the upward tendency of axle loads and tyre pressures.¹⁰⁴ In a paper presented to the New Zealand

Institution of Engineers the Chief Engineer of the Main Highways Board deplored the lack of research into roading problems: "Until there is made a scientific and rational approach to this problem of road construction, overdesign will continue in some areas with the accompanying waste of money or, of much greater importance, there will be underdesign in other districts with costly failures as a consequence."¹⁰⁵ He claimed that to attribute the failure of New Zealand roads built on clay and silt foundations to condensation of moisture under the bitumen surfacing was inaccurate—in almost every instance such failure was due to deficiencies in design and construction.¹⁰⁶ Bridging, as has already been noted, was also giving cause for grave concern and to get over the immediate difficulties of the early fifties the board had to acquire from the army and the United Kingdom War Disposals Commission sets of Bailey bridging. The board's annual report for 1950 noted that "It has found ready use in that it can be erected quickly in emergency, and has also been utilised to hold up some of our wooden truss bridges which would not otherwise carry the loads. . . . It has been used for forty bridges, and is at present in use on thirty of these, and may expect to remain in some cases up to five years."¹⁰⁷ The basic difficulties were the scarcity of contractors and skilled bridging labour, and the short supply of cement and steel. So desperate was the situation by 1952 that the board actually made representations to both the Royal Commission on Railways and the Roading Investigation Committee in the hope that some of the heavy loading on the highways system as a whole could be redirected—presumably back to the railways.¹⁰⁸ Minister of Works, Stan Goosman, summed up the position in the early fifties when he reported in 1953:

"The condition of the country's highway system is causing the Government some concern as so far it has not been possible to overtake arrears of maintenance and normal improvements which of necessity had to be restricted during the war years. The expansion of all forms of road traffic has created additional problems, and the country's resources have not been such as to permit of a more intensive programme than has actually been undertaken."¹⁰⁹

In spite of the problems some very significant developments occurred in roading in the early fifties. The most spectacular was undoubtedly the opening of New Zealand's first section of motorway in December 1950. It ran for 3 miles between Takapu Road and Johnsonville, part of the main approach to Wellington City. The decision to construct motorways in areas of high density traffic had been made in the early forties, but it was the same old story of necessary restrictions and delays. As Semple said in 1948:

"It is obvious that they are overdue and urgently necessary. Unfortunately, works of even higher priority, such as housing and hydro-electric development, are absorbing most of the materials and man power at the present time

and it is, therefore, not possible to push ahead with the construction of motorways as I would wish.”¹¹⁰

More than two decades later it is difficult to appreciate the novelty of the first motorway but something of this is to be found in an article in the *Evening Post* explaining to its readers the nature of a motorway:

“The motorway . . . has its own regulations and rules, for it is neither highway nor street, but a ‘motorway’, built expressly for through traffic. Thus no one may build homes, shops, nor bowzers to its frontage; nor may anyone enter the motorway except at definitely stated and provided points.

It has been built with substantial ‘super-elevation’ to make safe higher speeds than upon State and Main Highways though for the time being, until drivers get the hang of the motorway idea, the limit speed will be 50 m.p.h.

...
It is a motorway for motors. Pedestrians may not enter it, nor cyclists; nor will wandering stock, nor the farmer’s milking herd, taking a short cut to the dairy, be tolerated.”¹¹¹



Wellington urban motorway looking north from Murphy Street exit. Opened 1969.
Ministry of Works.

The 1960s witnessed the real era of motorway construction with the programme absorbing an increasing share of all monies available for State Highway construction, sometimes, it was feared, at the expense of improvements to rural State highways.¹¹²

Another major area of progress in the early fifties was in the extension of paved or sealed surfaces. By 1954 the central highway between Auckland and Wellington was finally sealed in its entirety.¹¹³ But even in this field there were factors which mitigated against overall improvements. Indeed in 1953 the Main Highways Board announced that it simply could not keep pace with the requirements of traffic.¹¹⁴ As a result both surfaces and foundations were suffering badly. The board warned that "indications are that paved surfaces generally are being damaged at a greater rate than can be remedied by repair work, and unless this trend can be arrested there is a possibility of some sealed lengths reverting to gravel surfaces."¹¹⁵ Although the damage could be partly attributed to drainage and subgrade defects, the basic causes for concern were the increased speeds and weights of many heavy vehicles, and particularly the high tyre pressures on the newer models of passenger buses. The National Roads Board's programme was designed to cope with this situation and it listed 10 priorities in order of importance:

1. Top priority to maintenance.
2. The maximum effort towards the extension of sealing.
3. A need to strengthen road crusts.
4. A vigorous attack on the bridging problem.
5. The expeditious completion of worth-while sections of motorway.
6. Reconstruction of substandard lengths of highway system.
7. Special attention to road safety and the elimination of "black spots".
8. A need for the Ministry of Works to expand laboratory and technical intelligence service.
9. The National Roads Board to relieve transport operators of all existing composition charges and levies in the case of extraordinary damage to industrial roads, and local authorities to be compensated from the National Roads Fund.
10. Special roading grants to be made to those local authorities who through lack of finance are unable to build and maintain their roading system to a desirable standard having special regard to increased production and to the maintenance of backblocks roads.¹¹⁶

After nearly 20 years of National Roads Board administration the basic problem of ever-increasing traffic and ever-heavier loads still remains. In some areas the causes are very specific. The export trade in timber in the Bay of Plenty involves the transport of well over 1 million tons of logs per annum from the forests to the port at Tauranga. As the Minister of Works, P. B. Allen, told a meeting of the International Road Federation "It is

extremely doubtful if one could find anything more effective than a steady stream of fully-loaded logging trucks to locate any weak spots on a highway."¹¹⁷ Here is an industry which has built up in 10 years from virtually nothing and the roading in the affected area had simply not been designed to cope with such traffic. As a result heavy additional expenditure has been necessary to reconstruct or strengthen the affected routes. Generally, however, it has been the increasing use of road transport by all sectors of the community which has created pressure on the roading system. No longer is the low cost two-coat seal surface, the development of which was pioneered in New Zealand, adequate for roads carrying high volumes of heavy traffic. Allen speaking in 1968 described our roading as "basically Class II, [that is it allows 6½ tons on spaced axles and 5 tons in other cases] and because of this can be said to lag behind the United States, Canada and Australia as far as meeting the needs of heavy traffic are concerned. We do, however, cater better than most countries for private car travel."¹¹⁸ It is in connection with the problem of strengthening roads for heavy traffic that the debate over the use of concrete for paving has arisen. The rising costs of roadworks raised the question of how much should be spent on ensuring long-lasting surfaces. The Commissioner of Works described the situation in 1969:

"Because New Zealand is young geologically our hillsides are frequently unstable and sensitive to man-made interference; foundation materials can vary from good to bad in distances of only a few feet; a bridge pier can be founded on rock at one end and on 60 foot piles at the other only 30 ft. away. The volcanic soils of the North Island are particularly variable in this way but even our most widespread sedimentary rock, greywacke, varies enormously and erratically.

For major works based on soil, such as earth dams, the integrity of the structure is all important. In such works very large sums of money are spent on investigations of foundations and materials, on design and quality control during construction."¹¹⁹

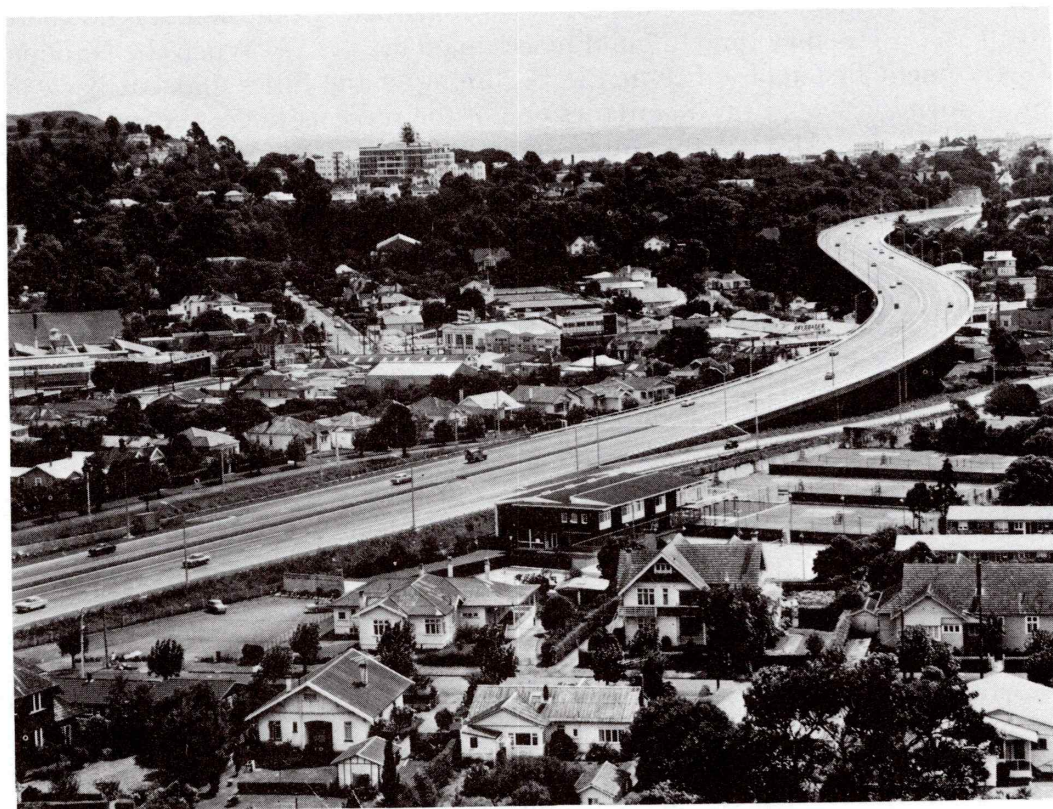
But he went on to say that in the case of other structures such as highways it was more sensible "that we should accept some failure rather than over-design at great cost in an attempt to avoid trouble."¹²⁰

Other developments in the fifties and sixties included the increased use of prestressed concrete, particularly for bridging;¹²¹ and the use of aerial surveys and maps for the planning and location of highways. In his Presidential Address entitled "Human Engineering", delivered to the New Zealand Institution of Engineers, A. F. Downer compared this technique with traditional methods:

"... one can never forget the healthy ruggedness of the life in the survey camps, and the months of strenuous work involved in the running of trial lines with the seemingly endless levelling and cross-sectioning of miles of

rough country . . . Today these routes would be flown over by aircraft fitted with special cameras and in a matter of hours as much information would be recorded as would [be in] a year's work of a well-equipped survey party."¹²²

Actually aerial surveys do not eliminate the need for ground parties entirely but limit their work to fixing co-ordinates and levels of control points as required.¹²³ In some cases the application of advanced techniques created problems in the solution of which Ministry of Works engineers led the world. The Newmarket Viaduct in Auckland was designed in 1961 and construction completed in 1965. In its first year of operation it showed an opening of construction joints which should not have occurred. It took a great deal of work to establish the cause—the temperature gradient from upper to lower surfaces of the box girders was much higher than had been expected or allowed for.¹²⁴ Investigations showed that the magnitude and effect of temperature gradients on the design of certain prestressed concrete continuous

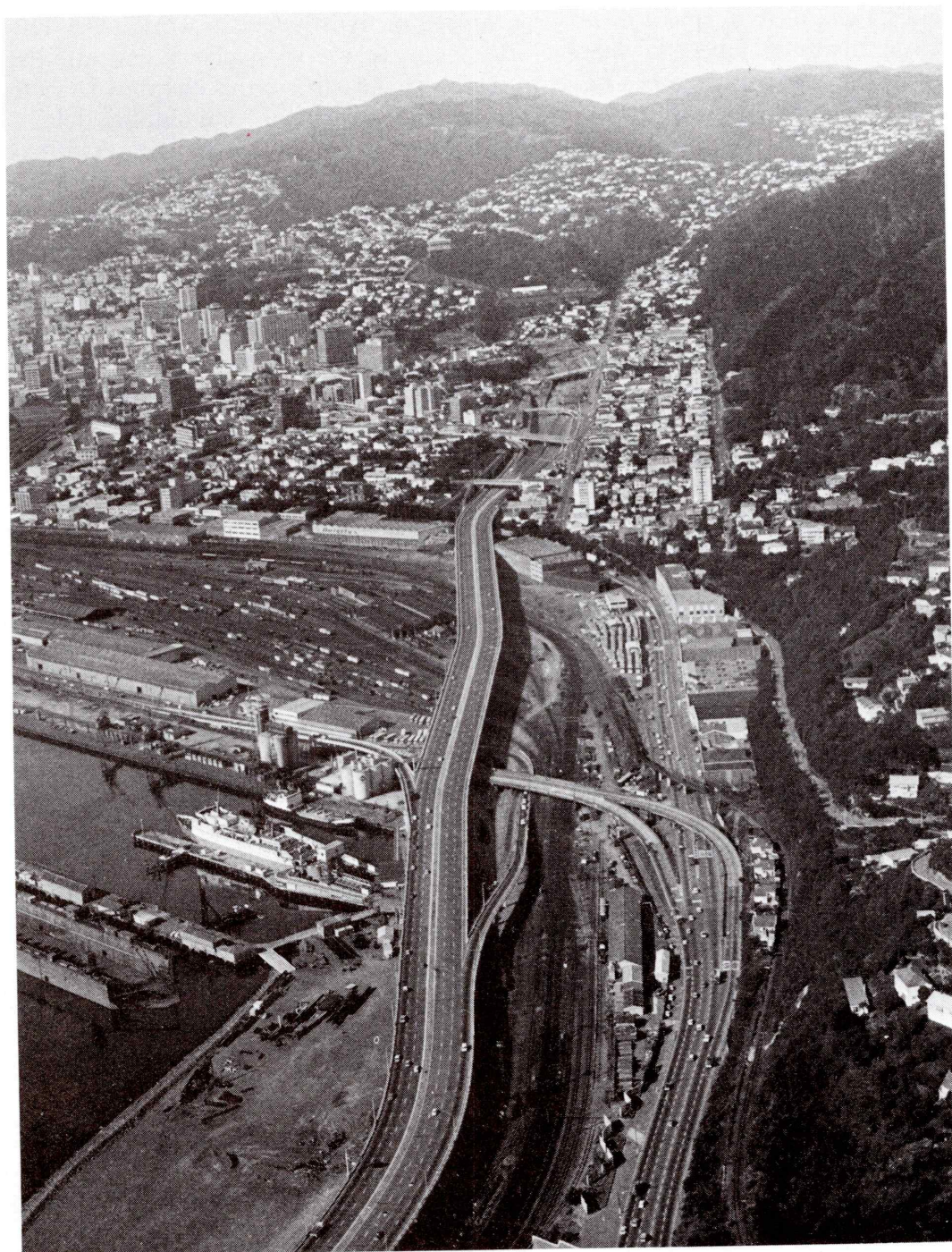


The Newmarket Viaduct, completed in December 1965, brings the motorway from the south into the central business area of Auckland. It is half a mile long. *Ministry of Works.*

box girder structures had only been appreciated in the years since the viaduct was designed, and that there was no agreed solution to it. As a result of these findings the Ministry of Work's Chief Designing Engineer prepared a code of practice on temperature gradient which was believed to be the first issued on this subject anywhere in the world.¹²⁵

By the end of the Ministry of Work's first century roading construction had obviously become an enormously sophisticated and complex technical undertaking with many constructional problems still unresolved. Yet the most basic questions about the future of roading in New Zealand were not concerned with the technical aspects but with establishing what priority roads should have in the national development. In 1961 the Deputy Chairman of the National Roads Board reported that: "Roading is the biggest of all this country's constructional undertakings, exceeding that of any other Governmental or business endeavour. No country devotes a higher proportion of its national expenditure to roading for each head of population than does New Zealand. But there is not one district that is not asking for more."¹²⁶ The one-time Government Architect, Gordon Wilson, was quoted as saying that "New Zealand had developed ways of going places, but there was nowhere to go. . . . it was now time to build places to go to . . ."¹²⁷ When the National Government first took office at the beginning of the fifties and cut back on State spending on cultural activities one of the projects to get the axe was an historical atlas. Dr W. B. Sutch quotes "an unusual Ministry of Works officer" as saying wistfully that "We could have a really handsome atlas for the price of a chain of motorway."¹²⁸ The Wellington City Council already trying to cope with a desperate housing shortage, found the situation severely aggravated by the acquisition and demolition of innumerable inner city residences to make room for a motorway. The City Council estimated that it would cost more than \$2 million to rehouse the people displaced by the foothills motorway.¹²⁹ In planning such motorways no estimate is made of the social cost, the only aim of a motorway being the free flow of traffic. Clearly resolving such conflicts of priorities is outside the competence of both the Ministry of Works and the National Roads Board—it is a matter for the community as a whole; but it is precisely such problems which must be resolved before the role of the Ministry of Works in its second century can be accurately assessed.

Roading of course is not the only area of public works where decisions must now be based on considerations other than the purely technical and economic. Particularly in the development of the country's power resources such factors are becoming crucial. In the early fifties the overriding consideration was how to overcome power shortages and keep ahead, or at least abreast, of the ever-increasing demand for electricity. W. S. Goosman on assuming office promised that whatever the difficulties "a special attempt



The motorway into Wellington passes above the Cook Strait ferry terminal and crosses the railway yards to skirt the heart of the city. *Ministry of Works.*

will be made to accelerate the programme of hydro-electric work".¹³⁰ The main measures taken to achieve this—namely use of overseas consultants, designers, and contractors—have been discussed earlier in this chapter. Despite every effort to speed up work there were the occasional unavoidable delays. One of the most frustrating was the delivery from the United States of expensive equipment in faulty condition for the Maraetai I project. It took engineers several months to repair the five sets of cylinders and pistons used to lift the huge gates in the face of the dam.¹³¹

During the fifties the aim in the North Island was to complete the development of the Waikato River, investigate other possible schemes, particularly the Tongariro proposition, and initiate the use of thermal power for generating electricity. Development in the South Island went on at Lake Tekapo, at Roxburgh on the Clutha River, Lake Hawea, Cobb River, and at Benmore on the Waitaki River.

It was accepted that South Island hydro resources, being considerably greater than those of the North, would eventually have to be linked to the northern system. The timing of such a link, however, was the cause of one of the most serious controversies over power development which has occurred. In 1956 the National Government approved the investigation of proposals for connecting the networks of the two islands by transmission cable across Cook Strait and announced that this would be conducted as quickly as possible.¹³² In 1957 the Government was defeated and for 3 brief years Labour determined public works policy. In the field of public works where preliminary investigations and designs may take years and where contracts worth millions may have to be signed covering several years' work, the room for manoeuvre for any new Government is very slight indeed, unless it is prepared to face charges of needless waste of taxpayers' money by jettisoning projects already planned or under way. Add to this the persuasive power of technical experts who after years of planning are unlikely to accept that the scheme they have proposed is faulty or unnecessary. It takes a very strong Government with a very deeply held belief in the correctness of its policy to make any dramatic alterations to the existing programme of public works. A new Government may add to the programme, increase expenditure, and even modify priorities within limits, but any significant redirection will occur only over a number of years. In 1959 Hugh Watt, then Minister of Works, announced that: "In the field of electric power development the Government has carried out an exhaustive inquiry and has determined to concentrate in the meantime upon the separate development of North and South Island potentials."¹³³ Nevertheless, the ultimate objective of linking the two was to be kept in view and investigational work was to proceed. When National returned to power in 1960 it decided, on the advice of the Power Planning Committee, to halt work on a second hydro station at Maraetai on the Waikato (which was to



The Benmore power scheme with the lake beyond. In the foreground are the flood control gates and spillway, the earth dam, the powerhouse and penstocks. Mount Cook and Lake Pukaki are in the far distance. Commissioned in 1965. *Ministry of Works.*

be a peak load station for the North Island), and to accelerate work on the Cook Strait link.

The Power Planning Committee explained the reasons for its recommendations in a lengthy report part of which follows:

"In 1958 the construction of a second hydro station at Maraetai was authorised to serve as a partial alternative to the proposed Korokoro gas turbine station. Further it was to serve as the main peak load station in the North Island to complement the output of Wairakei, Meremere and the proposed Tongariro scheme which was put forward at the time. All this was done in conjunction with the deferment of the inter-island power link.

It has become evident that full development at Wairakei must await events and the outcome of tests. Furthermore, no decision can be reached yet on the Tongariro scheme. Additional plant is being added to Ohakuri, Atiamuri and Aratiatia, so that, although there remains some need for a partial installation in 1963-64 and 1964-65, just before the link-up with the South Island, the Maraetai II plant will not be needed for many years thereafter."¹³⁴

Work on Maraetai II had reached an advanced stage—more than £3 million (\$6 million) had been spent on civil engineering works (out of a total for that section of approximately £4,800,000 (\$9,600,000); generating equipment and electrical plant was ready for shipment from overseas and had to be accepted; and the future of 500 men employed on the project and their families was at stake. W. S. Goosman, again Minister of Works, argued that given the economic situation with the building industry in some areas over-committed, it was essential to defer State construction wherever feasible and that deferment of Maraetai II relieved the pressure on finance for construction work when such relief was badly needed.¹³⁵ But as the Power Planning Committee had said: "From the purely monetary viewpoint the matter is clear; from the human angle care would have to be exercised in implementing any decision to halt this project."¹³⁶ The Minister, however, felt confident that in this respect: "The disrupting effect of this change was fully understood and steps were taken to avoid hardship."¹³⁷

Although the majority of the personnel on the project may have been suitably accommodated with jobs elsewhere, there appears to have been less than minimal precautions taken to avoid undue deterioration of the work already undertaken. Newspaper men who visited the site described it as the "ghost of the Waikato", and a report in the *Dominion* said the £3 million hydro project had simply been left to rust and rot:

"Any impression the New Zealand taxpayer may have that Maraetai II is in 'mothballs' is shattered by a visit to the scheme.

Far from being cosily enmeshed in some dream-world protective cover, the North Island's £3 [\$6] million hydro white elephant stands starkly

exposed to the elements, with every appearance of having been deserted overnight. . . .

To the engineers who did the last concreting with little official encouragement the withdrawal was probably achieved with credit; but the enormity of the wastage is made more plain with every month which passes."¹³⁸

When, however, work began anew on Maraetai II towards the end of 1965 the then Minister of Electricity, T. Shand, claimed the cost to complete it would be only £500,000 (\$1 million) more than if it had not been stopped in 1961 and that this amount was "more than offset by the savings in annual fixed charges on money not yet spent on Maraetai II, even after escalation of costs is taken into account."¹³⁹

The completion of Maraetai II was only a minor event in the history of the development of the Waikato River for hydro-electric purposes. In many ways 1964 marks the end of a 20-year era of power station construction on the Waikato River for on 13 March power generation began at Aratiatia, the last constructed of the stations below Lake Taupo and on 23 March the Government approved in principle a new stage of hydro development—the development of the power potential of the waters of the mountain regions south of Lake Taupo. In the course of these 20 years there had been many moments of excitement and many incidents of great endeavour and achievement. One of these was the diversion of the Waikato around the Whakamaru dam site. It was vividly described by the *Dominion*:

"Men and machines fought the Waikato River for 17½ hours yesterday to divert it round the Whakamaru dam site. Time and again as the struggle lengthened into the night it seemed that the river would win, but a battery of bulldozers finally closed the river bed at 11.30 p.m. Work continued till 3 o'clock this morning. [Sunday] . . .

The stage was set . . . late last week. The barrier at the lower end of the diversion cut was removed by Thursday, and the following day the stop-log gate in the centre of the cut was removed. Half the flow of the Waikato River immediately took this route. The task ahead was to close the old channel with a dam of earth and rock and force the whole of the river through the diversion cut.

At 6 a.m. yesterday a team of bulldozers began nudging a huge pile of spoil into the river channel upstream from the diversion cut outlet. On the opposite bank a rock bluff some 70 ft. high was charged with explosive ready to roll the rock into the river at the most effective time.

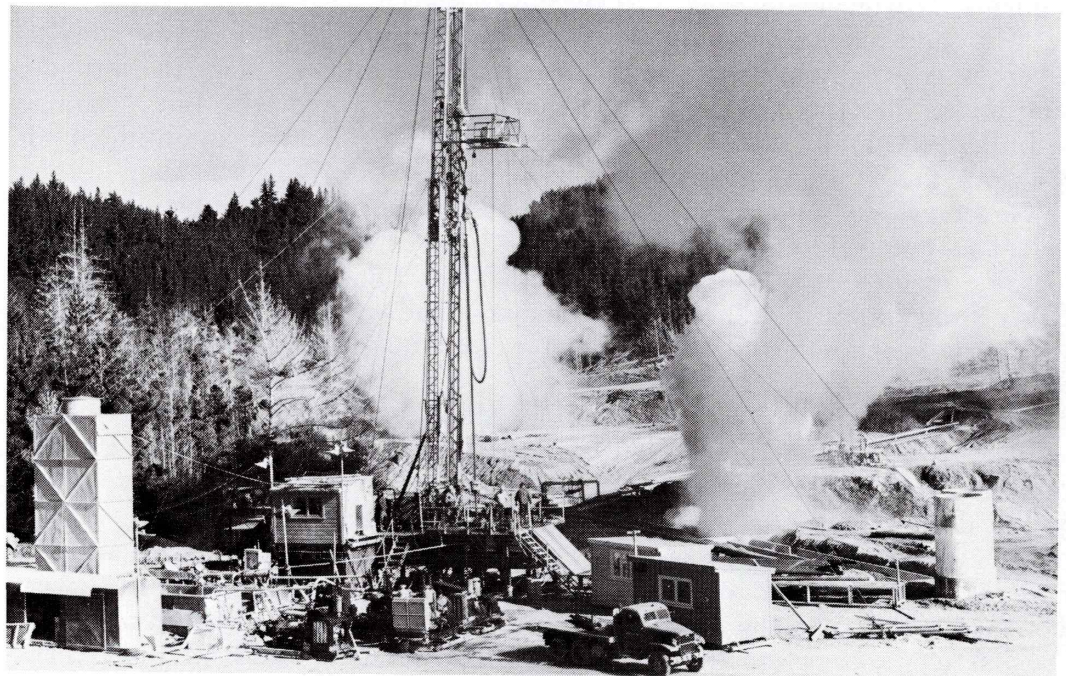
By 3.25 p.m. the river was reduced to about half its usual width, and the cliff was blown down, hundreds of tons of rock cascading into the river. For a second or two the flow stopped. Then the water rose behind and over the barrier, and before the bulldozers could return to seal off the river a fair volume of water was flowing again through the gap.

By dusk the gap was down to about 15 ft. or less. But at 8 p.m. the position was unchanged. Then it seemed that the river was widening the gap.

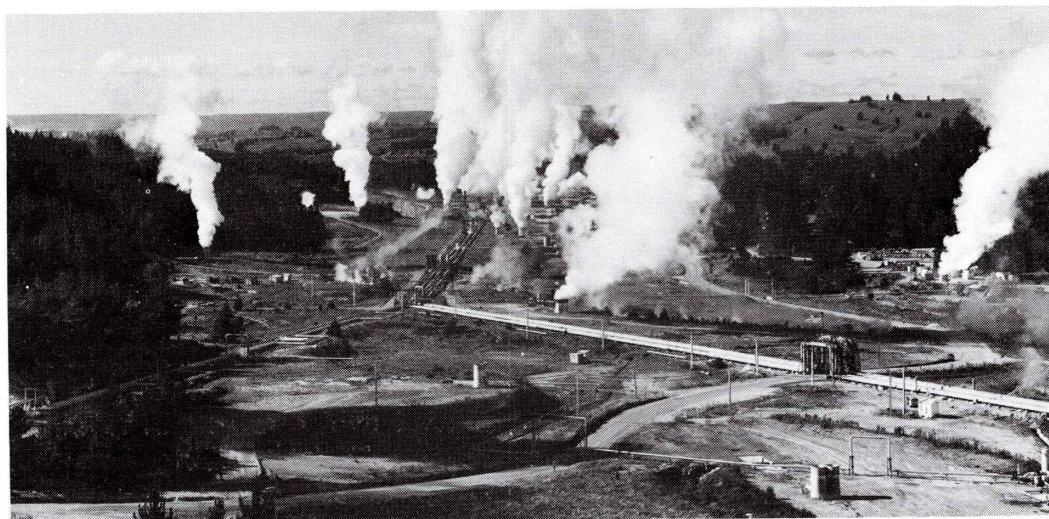
A concentrated drive by the bulldozers soon after 9 p.m. nearly succeeded, but the river took all this spoil away. Finally a bulldozer was driven triumphantly across the pile of spoil to the other bank at 11.30 p.m.”¹⁴⁰

An engineering achievement by Ministry of Works staff which attracted world-wide interest was the erection at Aratiatia of a prestressed and post-tensioned concrete surge tank, one of the largest of its type. The 55-ft-deep tank is, in effect, a safety valve designed to dissipate harmlessly the energy from the shockwave set up when the hundreds of tons of water moving through the tunnel have to be stopped quickly in the event of a transmission line failure or similar breakdown. Under such conditions the water will be forced up through an opening in the floor to surge up inside the tank, which has a capacity of 4 million gallons.¹⁴¹

Although hydro-electric projects predominated in the development of New Zealand's power resources in the 1950s and 1960s it was clear before the end of the Ministry of Work's first century that other sources of power for electricity were becoming important. Investigatory work into thermal power had begun in the forties and in 1948 the Commissioner of Works went to



Drilling for the production of geothermal steam at Wairakei. *National Publicity Studios.*



The borefield for the Wairakei geothermal power project. The pipeline conducting steam to the powerhouse crosses the right foreground. *Ministry of Works.*

Italy to study the geothermal scheme at Lardarello.¹⁴² Work at Wairakei proceeded steadily throughout the fifties and by 1963 the geothermal steam field was delivering more energy than any other station in the North Island.¹⁴³ At one stage in the fifties more money was being spent on power development from steam and coal than it was on hydro projects. The late sixties saw the introduction of the utilisation of natural gas from Kapuni and the possibility of exploitation of the huge Maui field which further diversified power resources.¹⁴⁴

But as with roading the end of the Ministry of Work's first century saw basic aspects of the development of the country's power resources being debated throughout New Zealand. The problem is how to provide ample electricity without unduly harming the environment and how to resolve a conflict between these two considerations when they clash directly. Concern for the environment pre-dates the mid sixties, although it was only then that it became a matter of popular involvement and action on a broad scale. Initially concern centred mainly on the effect of certain projects on areas of natural scenic beauty. As early as 1906 in the contract for the Arthurs Pass Tunnel on the Midland Railway a clause dealt specifically with "Preservation of Scenery":

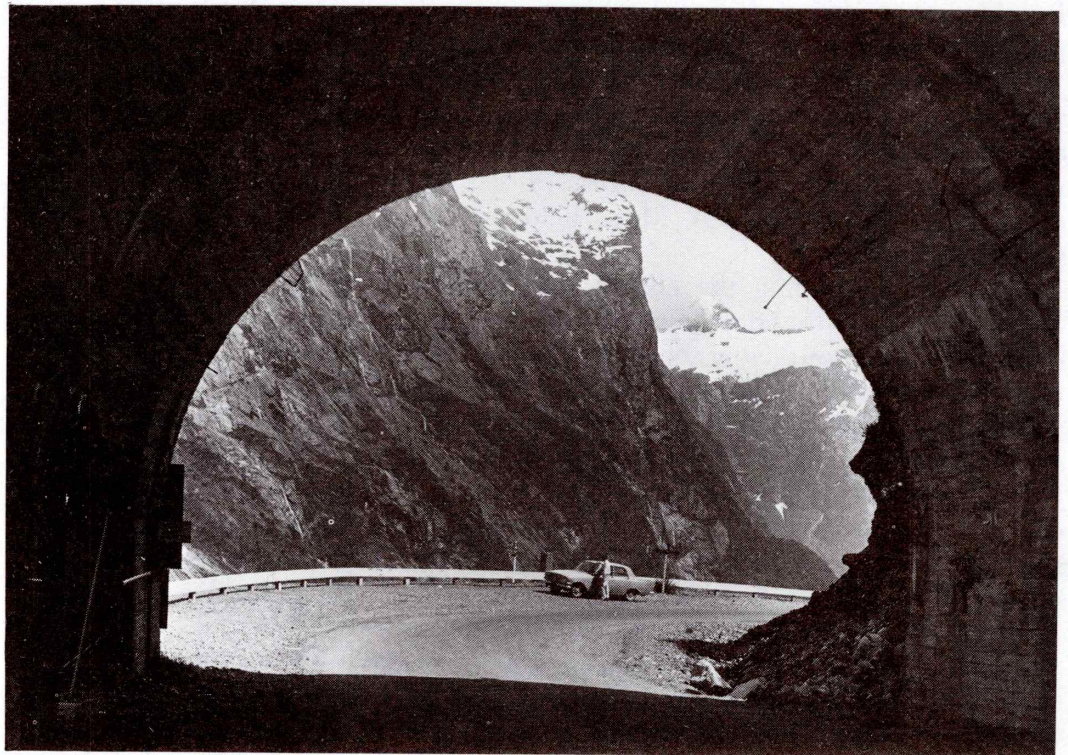
"The works are situated in a national scenic reserve. The Contractor shall carry out all his works in such a way as to cause no permanent disfigurements. Workmen or others connected with the works convicted of setting forest or bush or other vegetation on fire will be liable to immediate dismissal and to prosecution. Beyond the formation of the approach cutting

at the Bealey end of the tunnel no works of any kind, except such as may form part of this contract, and no cutting of timber will be permitted on the hill-sides on the left bank of the Bealey within 40 ch. of the tunnel-mouth, both up and down stream.

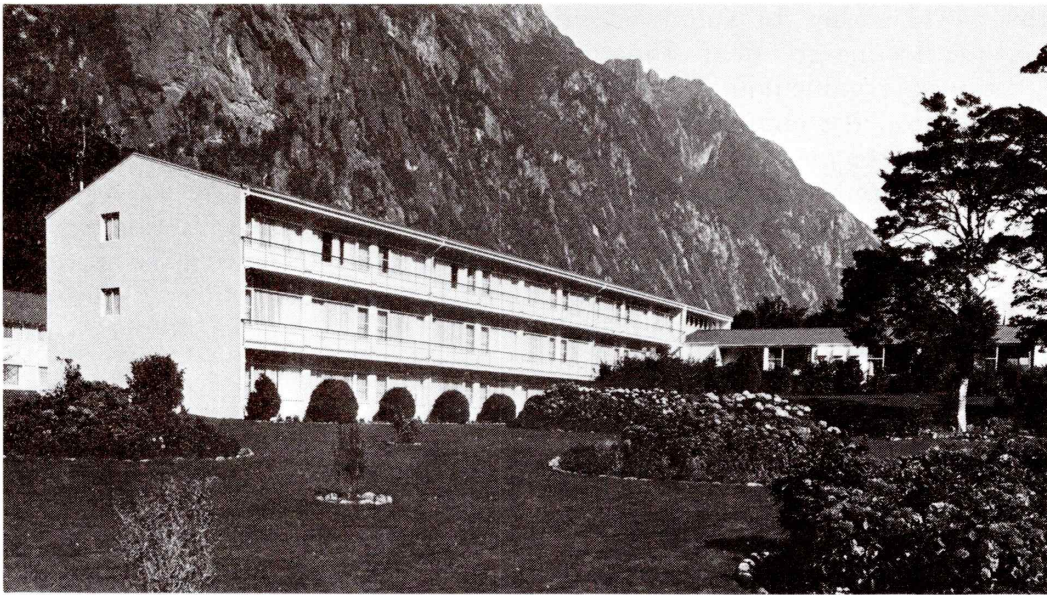
At the Otira end of the tunnel no timber will be allowed to be cut from the forest for construction purposes, and only firewood from fallen or dead trees will be allowed to be used by the contractors or workmen as permitted by the Resident Engineer. In the Bealey Valley timber may be allowed to be cut in such restricted quantities and in such localities as shall be allowed by the Resident Engineer."¹⁴⁵

In 1961 at a road symposium, organised by the Wellington Branch of the New Zealand Institution of Engineers, the regional planning officer for Christchurch argued the importance of preserving a beautiful countryside whatever the other considerations. She quoted from Arthur Bryant:

"For a perception of beauty is more important to man than physical safety; more necessary and far more attainable. For safety is not attainable in

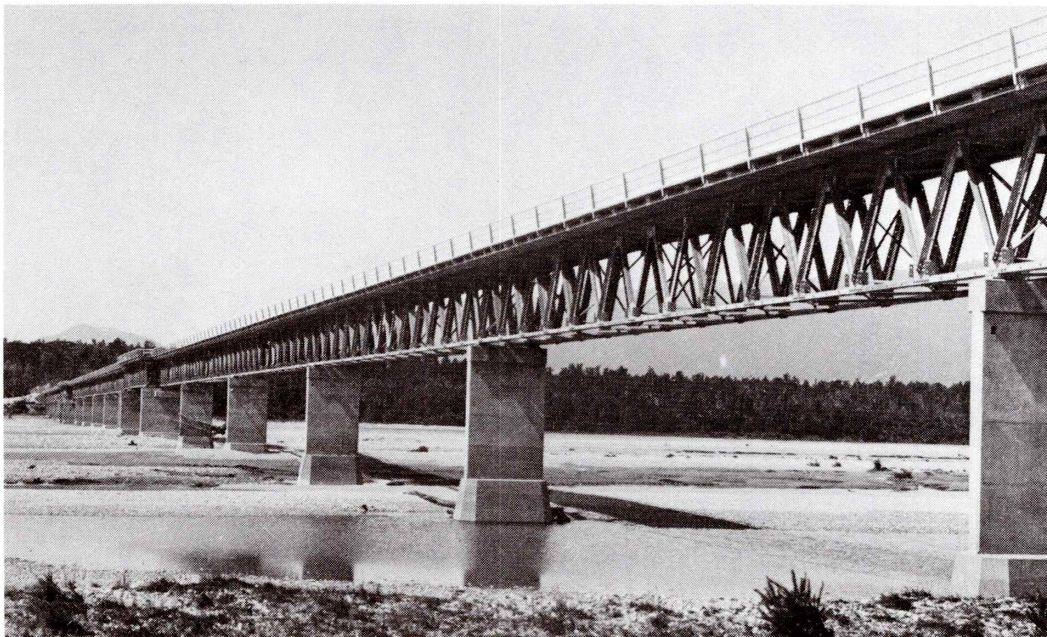


As he emerges from the Homer Tunnel the motorist gets his first view of the Cleddau Valley which the road follows to Milford Sound. *Ministry of Works.*



Milford Sound Hotel at the end of the road. *Ministry of Works.*

The lower Haast bridge, nearly half a mile long, is on the road linking two attractive tourist areas, Westland and Otago. *Ministry of Works.*



this world, either for young or old; but a perception of the glory of God and the fleeting grandeur of man is.”¹⁴⁶

Editorial comment on the symposium in *New Zealand Engineering* stated that: “Quite properly, emphasis was also laid on the need for our motorways and highways to be pleasant routes on which to travel; . . .”¹⁴⁷ In New Zealand’s professional publications for engineers throughout the fifties, there were from time to time desultory comments on the relationship between aesthetics and construction. An editorial in 1953 conceded that: “The artistic aspect of engineering structures is not unimportant.” It went on hopefully “and it may be that, with self-examination and self-education, we of the [engineering] profession will in time be numbered amongst the artists.”¹⁴⁸ Two years later the question was again raised when considering the actual responsibility of the engineer:

“Fundamentally, of course, he is expected to design and build a highway, a bridge or a structure for a certain purpose. First, it must fulfil this purpose, and, secondly, the cost must be within economic bounds. He must on no account waste the taxpayer’s money; but will the taxpayer complain if a small percentage is added to the cost to provide for an adornment or amenity not strictly in line with an efficient undertaking?”¹⁴⁹



This tunnel, $1\frac{1}{4}$ miles long, linking the port of Lyttelton with the city of Christchurch, was completed in 1964. *Ministry of Works.*

Of course opinions could, did, and still do, vary widely on the supposed merits of particular projects. In 1946 *New Zealand Free Lance* published an article on the Waikaremoana power scheme:

"When all the litter is cleared away higher up the slopes, and the great scheme is functioning, the Waikaremoana region will take on added beauty. There will be three stately powerhouses, and they and their tributary buildings, pipe-lines and patterned wires and towers will lend a decorative air to the panorama.

Housewives and countless others all over New Zealand will be blessing the work done here by the ceaseless output of controlled waters from lovely Waikaremoana. As they turn on the stove, or switch on the lights, they should never forget how it all comes about."¹⁵⁰

Speaking to the 1959 Travel Convention held at Christchurch, Dr J. T. Salmon, at the time Senior Lecturer in Biology at Victoria University, had quite a different view of the effect of hydro development on Waikaremoana:

"May I suggest you cast your minds back, those of you who remember Lake Waikaremoana before it was utilised for power development, [and you] will recall this gem of the North Island set amongst bush clad mountains with the forest dipping into its clear sparkling waters. Look at it now with an ugly tide mark round its shores, the forest separated from the water by some 50 feet; gone are the glorious inlets of Aniwaniwa, Mokau and Hoparuahine [sic] and in their place acres of mud flats growing weeds—ragworts, thistles, blackberries and raspberries—the lake surface studded with the gaunt remains of ancient forests exposed by the receding waters. During the electricity crisis of the early 1940's when the department was siphoning water out of Waikaremoana we were assured that once the crisis was over the lake would be refilled again to its original level. It may surprise you to learn that this can never be, as the Electricity Department has permanently lowered the level of Lake Waikaremoana by 20 feet. This once beautiful place despoiled so unnecessarily in the interests of expediency will remain for generations as a monument to the stupidity of engineers who operate without any knowledge of or thought for conservation practices."¹⁵¹

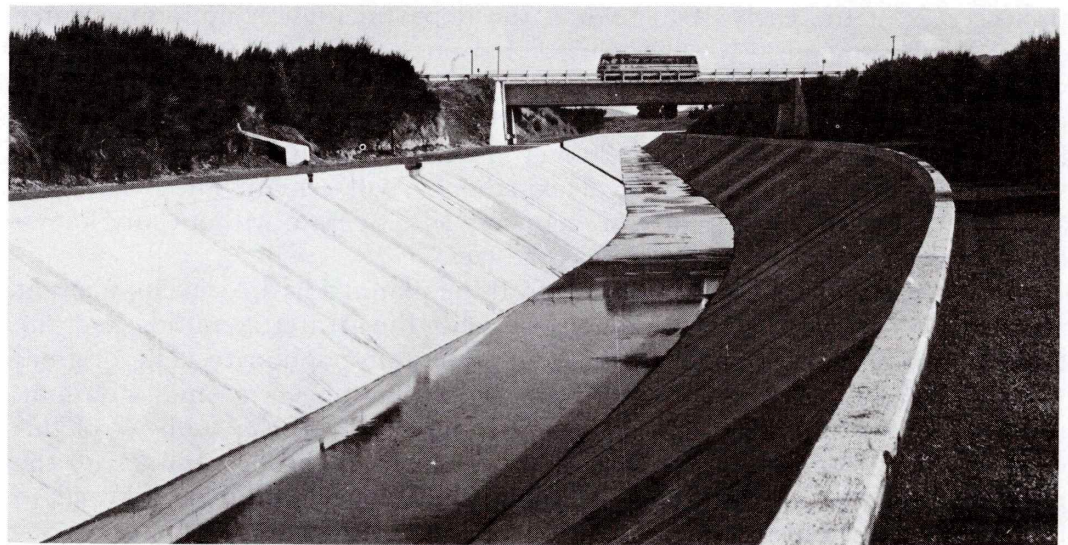
In the same address Dr Salmon attacked the planned hydro development at Aratiatia which he said would interfere with the Aratiatia rapids and the Huka Falls, both scenic attractions of considerable popularity. The original plan proposed by a visiting American consultant had been to build a dam at the head of the rapids and to incorporate the rapids as the spillway of this dam. The entire flow of the river was to be diverted through tunnels to the power house downstream but at suitable times water would be allowed to flow down the rapids for the benefit of tourists. The Ministry of Works constructed a model of the proposed scheme to allay the public's fears of the effects on the rapids. According to Salmon its vertical scale was exaggerated

four times which gave a false impression. Public pressure was such, however, that the final design in fact bypassed and so preserved the rapids¹⁵² and precautions were taken during construction to avoid any permanent damage to the area.¹⁵³

The plans to develop the Tongariro for hydro-electric purposes aroused even greater public attention and disquiet. Preliminary investigations were actually begun in 1956¹⁵⁴ but it was only in the early sixties that public opinion on the matter became vociferous and this illustrates one of the inherent problems in planning major public works. Often considerable expenditure and time have been spent on preliminary work before it reaches a stage where the public is confronted with a project. At this stage technical and professional opinion is usually already committed and so the conflict between the two becomes inevitable as the latter has already arrived at a final position whereas the former is just beginning to understand its implications. Such a polarisation of attitudes was evident in an article written by artist Peter McIntyre on:

“New Zealand’s Disappearing Heritage
Today—The Nation’s Playground
Tomorrow—The Wasteland
Rampaging Philistine With Bulldozer Must Be Told
‘Hands Off’!

Gradually, on one pretext or another, the natural beauties of the country are being destroyed and a whole heritage is being lost.



This concrete lined aqueduct which will carry water from the Tongariro River to Lake Rotoaira is part of the Tongariro power development. The bus is on No. 1 State Highway.
Ministry of Works.

And now at last the recently-announced scheme of the Government to construct a series of dams on the Tongariro and to divert the Wanganui and the Whakapapa Rivers, the most callous scheme of them all, has roused thinking people to anger and protest. . . .

Schemes such as the proposed Tongariro damming naturally benefit those engaged in them to a high degree and so inevitably they ride roughshod over those who try to oppose them. . . .

Abroad in cities like Paris one is struck by the abundance of trees that make the city beautiful. Our engineers would say 'they interfere with the drains' and root them out."¹⁵⁵

The traditional policy that public servants should not engage in public debate on controversial matters has severely restricted the ability of the Ministry of Works and its various divisions to either defend its decisions or to educate and inform the public on vital issues. It has always been the role of the Minister to defend his department and while this has usually been done enthusiastically it has not always been particularly adroit or effective. In 1960, Hugh Watt, Labour's Minister of Works said:

"I am naturally concerned when from time to time there is public criticism of some construction work on the basis that natural scenic attractions may be despoiled. Such criticism is perfectly understandable and proper, but at times there is lack of balanced approach in the tenor of such criticism. Both the Government and the Department are conscious of the beauty of the natural settings of this country, and no segregated section of the community can lay claim to any higher sense of appreciation of the scenic value of these assets than the Departments concerned with their development and preservation. . . .

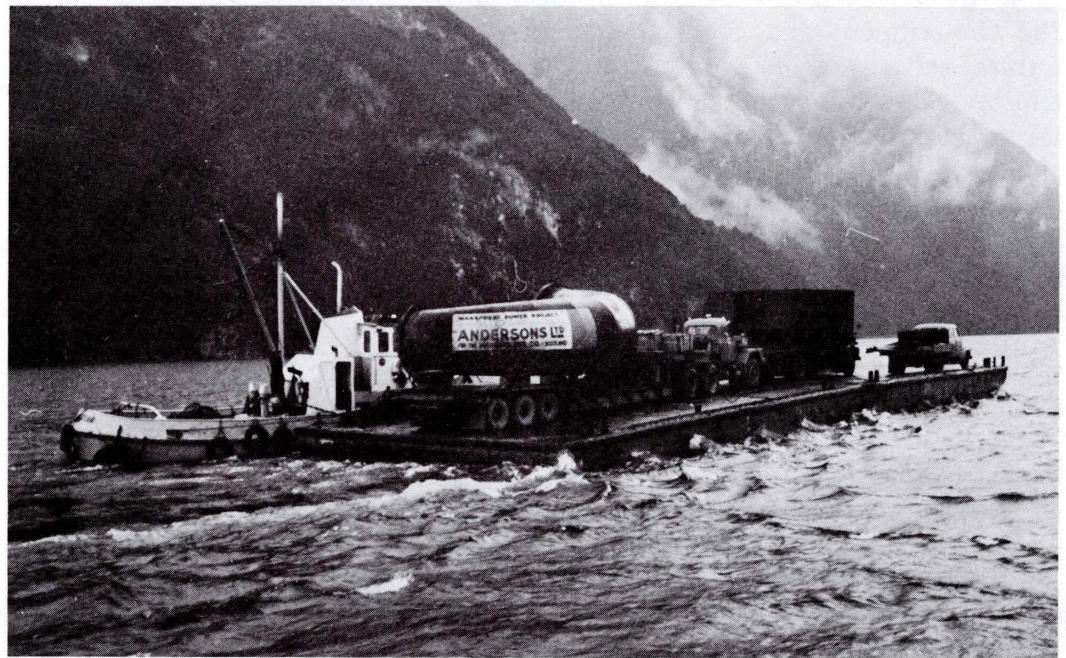
The Government and the Ministry of Works will continue to protect New Zealand's heritage of beauty to the maximum extent that it is possible so to do. Of that I am certain and I feel it is only fair that I should draw attention to the more positive aspect of the construction programme. I refer to the beauty of the new man-made lakes, the deliberate approach towards aesthetics and beautification in bridging and highways, the carefully planned development of power projects, and the open planning of residential areas."¹⁵⁶

In 1965 with particular reference to Tongariro, National's Percy Allen commented:

"Naturally a project of this size, embracing the headwaters of major rivers, and centred on one of New Zealand's most notable scenic and sporting areas, affects the interests of many people and the decision to construct has caused controversy from some interested groups and organisations. I would emphasise that the Department is fully aware of possible side effects of this scheme and will do everything practicable to minimise disturbance of natural beauty and assets, and to preserve the aesthetic value of the area

concerned. On previous hydro-electric schemes the recreational facilities have been extended and improved, and the Tongariro project, I am sure, will be no exception.”¹⁵⁷

The fuss over Tongariro seemed mild compared to the controversy over the raising of Lake Manapouri. Development of the Manapouri – Te Anau complex was subject to problems right from the start. Under the original arrangement Consolidated Zinc Proprietary Ltd. obtained water rights to develop the power scheme and transmit the power to an aluminium smelter to be built near Bluff.¹⁵⁸ Later it found it was unable to finance this huge undertaking and a fresh agreement was drawn up providing for the Government to develop Manapouri and build the transmission line as part of the national scheme. The consortium was to erect the smelter and take power from the Government at special rates. Thus in 1963 the department became responsible for the power development. The overseas consultants, the Bechtel Pacific Corporation, engaged by Comalco*, were retained for the design and engineering management of the work, the department exercising overall supervision.¹⁵⁹ Costs escalated beyond all expectations, industrial relations were frequently troubled, and changes in design were necessary as unexpected conditions were encountered. Conditions for operation of the power scheme,



*A consortium of the original firm with American and Japanese interests.

Unique among New Zealand power schemes, Manapouri is isolated from the country's roading system. Here a barge on the lake conveys the transporter which has brought part of a scroll case from Christchurch. *Bechtel Pacific Corporation. Ministry of Works.*

including maximum levels for the lakes, were included in the original arrangements. Some opposition was voiced when these became public but it was not until after the scheme was in operation, when details of the proposed dam to control the outflow from Lake Manapouri were published, that the possible effect of the power scheme was fully realised. As the Ministry of Works ended its first century the controversy over raising the level of the lake showed no signs of abating*, while the Government of the day went to great lengths to postpone a decision on the matter. In fact the Ministry of Works as such did not give evidence at the Commission of Inquiry into the question of raising the lake, despite the suggestion that its evidence on certain engineering and constructional problems would not have coincided entirely with that of the New Zealand Electricity Department, particularly with regard to the cost of clearing the lake shores prior to raising.¹⁶⁰ This fact illustrates yet again the increasing complexity of the decision-making process in public works—aggravated because responsibility is divided between various departments. Another example of the same point was provided in



The power station at New Plymouth, designed to burn either oil or natural gas, is due to deliver power early 1974. Picture taken August 1972. *Charters and Guthrie*.

*Other projects which also concerned environmentalists at the end of the sixties included the New Plymouth Power Station, which many consider disfigures one of the most attractive areas in New Plymouth. (See for example *Weekly News*, 16 November 1970, p. 19.) The proposed motorway through the Paremata Harbour just outside Wellington was also meeting with strong opposition—again there was a lag between the completion of initial designs which were apparently accepted by the local community (*Evening Post*, 19 May 1965) and the development of opposition once work actually began (*Weekly News*, 1 June 1970, p. 10).

an article on the outcome of the Tongariro development on fishing in the area:

"The key authority is the freshwater division of the Marine Department, which acts in a research and advisory capacity to the wildlife division of the Internal Affairs Department.

This department, which is charged with the task of representing wildlife and acclimatisation society interests, in turn advises the Ministry of Works which is acting as construction agent for the New Zealand Electricity Department."¹⁶¹

As Dr J. T. Salmon pointed out in 1959 "the problem of preservation of scenic reserves is one facet of the much larger problem of conservation"¹⁶² and although it is a major one, conservation is only one of the factors contributing to the increasing complexity of public works. Technical innovations, while they allowed for greater development with improved techniques, also added considerably to the complexity of policy formation and decision-making in the public works field. Referring to road and bridge design the Ministry of Work's then Chief Designing Engineer, R. G. Norman, commented that a new relationship had developed "between the work of the transportation engineer and the social framework. No longer could cause and effect be separated. Instead, the very solution to problems in transportation became themselves the origins of new problems of a higher order."¹⁶³ In the field of public buildings the complexity of modern structures still further blurred the areas of responsibility of the architect, the structural engineer, and the building services technicians*.

The expansion of the State's activities in every field over the past 100 years has added to the complexities of administering public works, and nowhere is this better seen than in the land purchase and the legal sections of the Ministry of Works. At times administrative difficulties have arisen from confusion over how responsibility was divided between various departments—some such difficulties occurred in the early years of the Soil Conservation and Rivers Control Council. Hopes had been high that it would be fully functioning once the war emergency was over, but the council's eighth annual report revealed a very unsatisfactory situation:

"Departmental differences of opinion in regard to the administration of soil conservation work by the Council have delayed the appointment of adequate specialist soil conservation staff, with the result that progress has been retarded."¹⁶⁴

By the mid fifties some rationalisation had taken place and the role of the Ministry of Works was reasonably defined:

"The Department has continued to provide engineering service to the Soil Conservation and Rivers Control Council. All river control, flood prevention, and drainage proposals prepared by catchment boards and other

*The Annual Report of the Civil Engineering Division for 1961 pointed out that "restricted ground space and increasing value of land" had caused a trend towards taller buildings which had called for "more detailed design and the use of advanced techniques of fabrication of structural steel and reinforced concrete." (*AJHR*, 1961, D. 1, p. 19.) As early as 1953 it was recognised that the increase in costs of public buildings was largely due to their increasing sophistication (*ibid.*, 1953, D. 1, p. 12).

local authorities submitted to the council were examined and reported upon by the Department.

Hydrologic surveys and investigations are being undertaken by the Department and full-time hydraulic and survey parties are operating in the field."¹⁶⁵

However, there was still a plethora of bodies involved. In 1966 the Government set up a National Water and Soil Conservation Authority to control all of them and the Ministry of Works was asked to set up a special division to service the new body in the same way as the National Roads Board was serviced by the Roading Division. By 1968 the Water and Soil Division was firmly established and it appeared to be successful in integrating the various disciplines concerned with the management of water and soil resources.¹⁶⁶

The growing emphasis on the need for adequate town and country planning was another indication of the multiplicity of factors involved in public works decision making. The Ministry of Works became responsible for administering the Town and Country Planning Act 1953. Under the Act local bodies are invested with "full authority and responsibility for planning, subject only to the preservation of rights of appeal and co-ordination of schemes through the central Government." As well as generally administering the Act, Ministry of Works is responsible "for co-ordinating the proposals of all State departments in respect of any particular area [and] to keep the local body concerned fully acquainted with State activities."¹⁶⁷ The department was also to supply a general information and technical advisory service in respect of town-planning matters to any local authority that needed such a service. Unfortunately 12 years after the Act was passed this essential service was still not widely available—staff shortages severely affected this section of the department. In 1965 the Minister drew the country's attention to the inadequacies of both local and State planning capabilities:

"Local authorities could show more initiative in the preparation of their schemes, many of which do little more than set the limits of urban expansion. It has become apparent that many deficiencies in district schemes are the result of inadequate background investigations or a failure to recognise and meet the problems of urban and rural development. In this respect it would seem desirable for local authorities to be more active in bringing their difficulties to the notice of the Department, and to discuss at an early stage the technical and procedural questions relating to town and country planning practice and to the co-ordination of public works with the provisions of district schemes. The Department in turn is hard pressed to provide the information required of it for inclusion in schemes."

In no uncertain terms he spelt out the consequences of such a situation:

"The absence of sound planning advice at this stage of New Zealand's planning history could result in mistakes which will have severe repercussions in the future."¹⁶⁸

A. De T. Nevill, at that time Director of Civil Aviation, in an article on "Planning Wellington Airport" summed up another aspect of the situation when he wrote that "the integration of professional knowledge over a large number of specialist fields is one of the most difficult problems facing the modern technical administrator." He went on to explain that he had been associated with Rongotai Airport for 25 years and that over this period it had presented "a confused medley of problems, political, administrative and technical, which tended to induce slight hysteria and dizziness in the minds of those who were required from time to time to tender advice, more especially since the vehicle for which the airport had to be designed was being transformed at a rate quite beyond reasonable predictions."¹⁶⁹ The construction of Rongotai Airport did not involve any really remarkable or difficult feats of engineering, but as another writer on the subject has said the "impact on the local community, on the City of Wellington generally . . . was considerable."¹⁷⁰ Among the difficulties encountered were differences over planning details—a visiting American consultant disagreed with preliminary



The Wellington Airport, opened in 1959, has had to be extended. This view was taken in January 1964. *National Publicity Studios.*

Ministry of Works plans;¹⁷¹ difficulties over obtaining satisfactory tenders for the earthworks;¹⁷² then difficulties over the satisfactory execution of the earthworks—most of these involved problems with the use of conveyor belt equipment for transmission of spoil to the reclamation.¹⁷³ Costs escalated and completion dates receded. Running parallel with the technical complications were difficulties with the public. These should not have been unexpected given the need to obliterate a substantial residential area to make way for the airport. There was a tremendous feeling of insecurity amongst landowners in the area and even after all required properties had been purchased rumours would from time to time unsettle those that remained. An article in *The Standard* conveyed something of the atmosphere:

“So nervous are residents that some have approached *The Standard* saying ‘We have seen men on the street peering at our house. They looked like Ministry of Works men.’

The Standard asked: ‘What makes Ministry of Works men look any different from other people?’

Householders’ reply: ‘Anybody looking at houses out here are bound to be Ministry of Works men. Who else would they be?’ ”¹⁷⁴

The main source of discontent amongst residents, however, was the noise and dust created by the earthworks. Although contracts provided for silencers and other measures to reduce the nuisance to a minimal level the locals often disagreed with Ministry of Works officers and the contractors over what constituted an acceptable maximum. After one series of complaints the District Commissioner of Works reported to the Commissioner that the contractor was doing all he could and that: “The noise is less than Khandallah residents have to put up with from electric trains and less than heavy traffic noise generally.”¹⁷⁵ The Minister of Health, however, suggested that the residents on this particular occasion had some cause for complaint¹⁷⁶ and the contractors were then instructed to take further steps to reduce noise. Such incidents highlighted the need for greatly improved communications between the department and the public, though nothing was done about this problem until the mid-sixties.

The Rongotai project also demonstrated that it was essential for the administrative organisation to keep abreast of changing technical methods. Perhaps the most painful evidence in the unfortunate criminal proceedings initiated in 1960 against a few contractors and Ministry of Works officers (for malpractices and falsification of documents relating to plant hire and material supplies) was that inadequate administrative procedures had allowed such undesirable activities to continue undetected for some time.¹⁷⁷ Some important modifications were introduced as a result.

The introduction of the computer has assisted an increasingly sophisticated approach to public works planning* but so far no consensus has emerged on

*In 1961 Ministry of Works had its first experience of the use of a high speed electronic computer in its technical work. The department shared with the DSIR one-third of the available time on the Treasury’s type 650 computer. Eleven engineers were trained as programmers to handle the work. From 1961 the computer and data-processing sections operated as part of the Central Laboratories, of the chief accountant’s branch or of other operating divisions according to the nature of the work. In 1968 however these activities were brought under co-ordinated control and a separate section established responsible directly to top management.

the relative importance of technical, political, economic, and social factors in public works policy formation. I. M. Carrie's study on the formal organisation of the Head Office of the Ministry of Works suggests that the engineering profession is beginning to reassess its pre-eminence. That supremacy based on "technical skill and professional mystic [mystique] in the field of public works policy formation has been considerably eroded".¹⁷⁸ The community now recognises public works as an extremely complex and vital aspect of this country's development, environment, and social fabric, and the result will be increasing scrutiny and discussion of public works decisions.

Throughout the last 20 years there has been sporadic criticism of the Ministry of Works not just from environmental groups but from other bureaucratic bodies such as local authorities¹⁷⁹ and the power supply authorities.¹⁸⁰ Invariably the criticism centred around the size and power of the department and the critics advocated decentralisation and the breaking up of Ministry of Work's component parts into independent departments. The department's opposition to any proposed split is based on the belief that duplication of planning, design, and technical services is uneconomical in terms of New Zealand's size and impractical in view of the difficulty in attracting qualified staff. With regard to its construction activities the department has claimed that it could not provide research services and technical information unless it has the opportunity to gather the technical information necessary to formulate practices, procedures and standards and then to test these new techniques and standards with its own work forces.¹⁸¹ An organisation with wide and diversified interests is much better able to discharge efficiently the functions outlined in the preceding paragraphs.

Somewhat belatedly, and in response to Cabinet approval "for a positive public relations policy in the Public Service,"¹⁸² the Ministry of Works formed in 1965 a Public Relations Committee to initiate such a policy and to formulate a programme for the department,* a summary of which was included in the 1965 departmental statement:

"The departmental public relations programme emphasises performance of good work, tidiness and good housekeeping, and consideration for the public, rather than publicity. At the same time it is agreed that the public is interested in the display of models and in the issue of information pamphlets, and that it is entitled to well set up information centres on large projects."¹⁸³

Despite the somewhat condescending attitude, it was a beginning. The following year the committee reported that: "Efforts have been made to publicise, in moderation, the men, organisation, and work of the Department in the belief that the public should be interested in the work of its employees and in the products of the taxes it pays."¹⁸⁴ It was clear by 1970 that during the department's second century public relations would have to develop a far more sophisticated approach. It was no longer enough to inform the

*A certain amount of ad hoc public relations activities had occurred before this date. For example by 1961 there was a particularly well-run information and viewing centre at Benmore hydro construction works.

public of decisions, some method of involving the public in decision-making from the very beginning of planning for a project was becoming essential.

At the end of the fifties the then Commissioner of Works F. M. Hanson described the Ministry of Works as having two principal functions of equal importance—that of an advisory service to the Government on national development and that of State construction agency. The Commissioner revealed something of the department's immense influence when he noted that in its advisory capacity the department offers advice on virtually all State and semi-State works, no matter where initiated; it advises on many local authority works and on any private works likely to have a major or a direct effect on the national economy. The second Labour Government's policy of stimulating industrial development in fact involved the Ministry of Works directly in the promotion of local industry. It was particularly concerned with "basic industry likely to have significant advantage in the saving of overseas funds, or in earning them by export of products of the industry."¹⁸⁵ Examples of the type of work undertaken are set out in the relevant departmental statements. In the early sixties the Ministry of Works was closely involved in the original agreements with Comalco; it provided technical assistance of various types to the New Zealand Refining Company, the Iron and Steel Investigating Company and Dominion Salt Ltd.¹⁸⁶ It could and did initiate investigations into areas of potential development. For example it was at the Ministry of Works' instigation that the Department of Scientific and Industrial Research surveyed the availability of silica, dolomite, and limestone of industrial qualities—all of which are of fundamental importance to various industries which depend largely on the availability of cheap bulk electric power.¹⁸⁷

As its functions have multiplied it has become difficult to define in simple terms the department's role in New Zealand society. In 1971 the Minister of Works described the future role of the Ministry as one of planning and of arbitration between the various factions and interests involved in development.¹⁸⁸ He described the type of planning role he envisaged:

"... my department and I are in a unique position to influence the pattern of [national] development. Not only do we advise on works but in many cases we carry them out. This makes it all the more important that we develop and retain in the public works scene the necessary skills and expertise to ensure the environment is being properly considered. By this I don't mean just the physical environment, but especially the social environment involving as it does many problems of behaviour and social activities. Just as you engineers who are devoted to building the nation must gain an increased and increasing awareness of these special needs, so must I as a Minister and my department, move towards broader base planning and construction in the interests of a better environment."¹⁸⁹

These were the words of a National Party Minister, but the Labour Party's policy for the department is not in conflict with this concept. A Labour Government in fact is likely to even further expand the advisory role of the Ministry of Works as well as increasing its construction activities.

When the Public Works Department was founded in 1870, New Zealand consisted of a disparate collection of scattered settlements. The establishment of the department was the beginning of the process which welded those isolated communities into a nation.

This history has shown how throughout its first 100 years the role of the department has varied. From being little more than a planning and consultancy service to the Government and carrying out capital construction works by contract, the development of the co-operative contract system saw the department assuming the managerial functions of contractors and hiring labour directly. Then with the increase of mechanisation and the development of major contracting firms, the amount of direct construction has declined and other functions have been added. As in the past, the Ministry will be required in the future to meet new demands and conditions. Indeed at the beginning of its second century the Ministry of Works seems to be on the threshold of a new, uncertain era which will likely involve exciting challenge and changes.

REFERENCES CHAPTER 9

- ¹ *AJHR*, 1952, D. 1, p. 3.
- ² *Ibid.*, 1950, D. 1, p. 2.
- ³ *Ibid.*, p. 3.
- ⁴ C. Firth, *State Housing in New Zealand*, Wellington, Ministry of Works, 1949, p. 5.
- ⁵ *Ibid.*, p. 67.
- ⁶ *AJHR*, 1950, D. 1, p. 61.
- ⁷ *Ibid.*, 1956, D. 1, p. 3.
- ⁸ *Ibid.*, 1950, D. 1, p. 10.
- ⁹ *Ibid.*, 1951, D. 1, p. 11.
- ¹⁰ *Ibid.*, 1956, D. 1, p. 14.
- ¹¹ *Ibid.*, 1951, D. 1, p. 11.
- ¹² *Ibid.*, 1952, D. 1, p. 12.
- ¹³ *Ibid.*, p. 11.
- ¹⁴ *Ibid.*, 1969, D. 1, p. 10.
- ¹⁵ *Ibid.*, 1951, D. 1, p. 52.
- ¹⁶ *Ibid.*, 1950, D. 1, p. 19.
- ¹⁷ *Ibid.*, p. 17.
- ¹⁸ *Ibid.*, 1952, D. 1, p. 14.
- ¹⁹ *Ibid.*, 1955, D. 1, p. 91.
- ²⁰ *Ibid.*, 1958, D. 1, p. 32.
- ²¹ *Ibid.*, 1961, D. 1, p. 6.
- ²² *Ibid.*, 1965, D. 1, p. 7.
- ²³ *Ibid.*, 1956, D. 1, p. 12.
- ²⁴ *Ibid.*, 1964, D. 1, p. 11.
- ²⁵ *Ibid.*, 1959, D. 1, p. 13.
- ²⁶ *Ibid.*, 1961, D. 1, p. 6.
- ²⁷ *Ibid.*, 1968, D. 1, p. 24.
- ²⁸ *Ibid.*, 1952, D. 1, p. 62.

- 29 *Ibid.*, 1955, D. 1, p. 105.
- 30 *Ibid.*, 1957, D. 1, p. 61.
- 31 *AJHR*, 1956, D. 1, p. 12.
- 32 *Ibid.*, 1958, D. 1, p. 9.
- 33 *Ibid.*, 1962, D. 1, p. 6.
- 34 *Ibid.*, 1959, D. 1, p. 13.
- 35 *Ibid.*, 1969, D. 1, p. 6.
- 36 *Ibid.*, 1956, D. 1, p. 13.
- 37 *Ibid.*, 1962, D. 1, p. 6.
- 38 *Ibid.*, 1955, D. 1, p. 14.
- 39 *Ibid.*, 1961, D. 1, p. 43.
- 40 *Ibid.*, 1957, D. 1, p. 19.
- 41 *Ibid.*, 1955, D. 1, p. 16.
- 42 *Ibid.*, 1957, D. 1, p. 19.
- 43 *NZE*, Vol. 8, 1953, p. 172.
- 44 *Ibid.*
- 45 *AJHR*, 1961, D. 1, p. 39.
- 46 *Ibid.*, 1962, D. 1, p. 4.
- 47 Address, "The Works Portfolio", by Minister of Works, 6 July 1971, to Wellington Branch of the New Zealand Institution of Engineers, pp. 1 and 2. Copy in Ministry of Works Library.
- 48 *NZPD*, Vol. 344, p. 3189.
- 49 *AJHR*, 1953, D. 1, p. 15.
- 50 *Ibid.*, 1970, C. 2A, also "Statement by Commissioner of Works on Kaimai Disaster", released to Press 18 August 1970.
- 51 File P.W. 92/12/1/4/2, memo, 9 June 1949.
- 52 *NZE*, Vol. 5, 1950, p. 321.
- 53 *AJHR*, 1950, D. 1, p. 12.
- 54 *Ibid.*, 1951, D. 1, p. 14.
- 55 *Ibid.*, p. 2.
- 56 *Ibid.*, 1952, D. 1, p. 2.
- 57 *Ibid.*, p. 1.
- 58 *Ibid.*, 1954, D. 1, p. 1.
- 59 See frequent examples, P.W. 92/12/47/8/1.
- 60 *Ibid.*, 26 August 1953.
- 61 *Ibid.*, 27 August 1953, p. 2.
- 62 See for example *ibid.*, 5, 21, 27, and 30 August 1953.
- 63 *Ibid.*, 10 March 1954.
- 64 *Ibid.*, 15 March 1954.
- 65 Sutch, W. B., "Takeover New Zealand", Wellington, Reed, 1972.
- 66 *AJHR*, 1964, D. 1, p. 6.
- 67 *NZE*, Vol. 9, 1954, p. 179.
- 68 *Ibid.*, Vol. 10, 1955, p. 143.
- 69 *Ibid.*, p. 144.
- 70 *Ibid.*, p. 145.
- 71 *Ibid.*, p. 234.
- 72 *AJHR*, 1954, D. 1, p. 18.
- 73 *Ibid.*, 1950, D. 1, p. 13.
- 74 *Ibid.*, 1953, D. 1, p. 12.
- 75 *Ibid.*, 1957, D. 1, p. 58.
- 76 *Ibid.*, 1953, D. 1, pp. 11-12.
- 77 Firth, C., "State Housing in New Zealand", p. 7.
- 78 *Ibid.*, p. 6.
- 79 *The Housing Division of the Ministry of Works*, Wellington, 1959, p. 2.
- 80 *AJHR*, 1952, D. 1, p. 3.
- 81 *Ibid.*, 1957, D. 1, p. 13.
- 82 *Ibid.*, 1959, D. 1, p. 40.
- 83 *E.P.*, 20 December 1967, p. 30.
- 84 *Dom.*, 22 October 1969, p. 10.
- 85 *A Case Study of Twenty State Houses and Families—Preliminary Findings*, Wellington, unpubl. M.O.W., 1969, p. 1.

- 86 "A Study of Medium Density Housing", Wellington, unpubl. M.O.W., 1969, p. 51.
- 87 *E.P.*, 30 May 1959, p. 22.
- 88 *Journal of the NZIA*, October 1955, p. 181.
- 89 *Ibid.*, Vol. 26, April 1959, p. 87.
- 90 *A Brief History of Public Buildings in New Zealand*, Wellington, M.O.W., 1970, p. 8.
- 91 *AJHR*, 1953, D. 1, p. 77.
- 92 *Ibid.*, 1955, D. 1, p. 90.
- 93 *Ibid.*, 1956, D. 1, p. 52.
- 94 *Ibid.*, 1957, D. 1, p. 55.
- 95 *Ibid.*, p. 60.
- 96 *Ibid.*, 1955, D. 1, p. 17.
- 97 *Ibid.*
- 98 *Ibid.*, 1960, D. 1, p. 22.
- 99 *Ibid.*, 1965, D. 1, p. 46.
- 100 *Ibid.*, 1954, D. 1, p. 5.
- 101 *Ibid.*, 1956, D. 1, p. 23.
- 102 *Ibid.*, 1962, D. 1, p. 31.
- 103 C. W. Dassler, *Highways Under the National Roads Board*, Wellington, unpubl.; copy in M.O.W. Library, 1972.
- 104 Newspaper clipping "Threat to Economy of N.Z. by Road Failures" filed under heading "N.Z. Roads" in Wellington Central Public Library.
- 105 *NZIE Proc.*, Vol. XXXIV, 1948, p. 306.
- 106 *Ibid.*, p. 325.
- 107 *AJHR*, 1950, D. 1, pp. 61-62.
- 108 *Ibid.*, 1952, D. 1, pp. 26-28.
- 109 *Ibid.*, 1953, D. 1, p. 4.
- 110 *E.P.*, 5 June 1948, p. 8.
- 111 *Ibid.*, 21 December 1950, p. 6.
- 112 See for example, *AJHR*, 1963, D. 1, p. 29.
- 113 *E.P.*, 17 January 1953, p. 8.
- 114 *AJHR*, 1953, D. 1, p. 36.
- 115 *Ibid.*
- 116 *Roading in New Zealand: A Brief Summary*, Wellington, National Roads Board, 1961, p. 5.
- 117 *New Zealand: Roads to Resources*, Wellington, National Roads Board, 1970, p. 6.
- 118 *Roading in New Zealand: A Brief Summary*, Wellington, National Roads Board, 1968, p. 3.
- 119 *AJHR*, 1969, D. 1, p. 6.
- 120 *Ibid.*, p. 7.
- 121 See for example *AJHR*, 1960, D. 1, p. 8.
- 122 *NZE*, Vol. 15, 1960, p. 90.
- 123 *Ibid.*, p. 75, Brayshaw, C. N.
- 124 *AJHR*, 1969, D. 1, p. 7.
- 125 *Ibid.*, 1970, D. 1, p. 17.
- 126 *E.P.*, 14 September 1961, p. 22.
- 127 *NZE*, Vol. 18, 1963, p. 79.
- 128 Sutch, W. B., *Quest for Security in New Zealand 1840-1964*, p. 408.
- 129 *Dom.*, 4 December, 1969.
- 130 *AJHR*, 1950, D. 1, p. 2.
- 131 *Dom.*, 3 November 1952, p. 9.
- 132 *AJHR*, 1956, D. 1, p. 5.
- 133 *Ibid.*, 1959, D. 1, p. 6.
- 134 *E.P.*, 14 September 1961, p. 19.
- 135 *AJHR*, 1962, D. 1, p. 3.
- 136 *E.P.*, 14 September 1961, p. 19.
- 137 *AJHR*, op. cit.
- 138 *Dom.*, 1 March 1963, p. 11, see also *Weekly News*, 7 November, 1962, p. 3.
- 139 *E.P.*, 3 November 1965, p. 19.
- 140 *Dom.*, Monday, 10 November 1952, p. 8.
- 141 *E.P.*, 23 December 1963, p. 7.
- 142 *Ibid.*, 17 September 1948, p. 7.
- 143 *AJHR*, 1963, D. 1, p. 3.

- 144 *Ibid.*, 1968, D. 1, pp. 12 and 15.
- 145 PWD 21898, Midland Railway, Arthurs Pass Tunnel Contract Specification, April 1906, p. 12.
- 146 *NZE*, Vol. 16, 1961, p. 351.
- 147 *Ibid.*
- 148 *Ibid.*, Vol. 8, 1953, p. 305.
- 149 *Ibid.*, Vol. 10, 1955, p. 307.
- 150 *New Zealand Free Lance*, 10 April 1946, p. 41.
- 151 *Travel Digest*, Vol. 2, No. 3, July 1959.
- 152 *E.P.*, 23 December 1963, p. 7.
- 153 *AJHR*, 1960, D. 1, p. 48.
- 154 *Ibid.*, 1956, D. 1, p. 33.
- 155 *E.P.*, 24 June 1964, p. 32.
- 156 *AJHR*, 1960, D. 1, p. 10.
- 157 *Ibid.*, 1965, D. 1, p. 3.
- 158 *Ibid.*, 1963, D. 4B, p. 7.
- 159 *Ibid.*, D. 1, pp. 3, 11 and 21.
- 160 Ritchie, R. F. D., former head of Power Engineering Division, interview with the author, October 1971.
- 161 *Dom.*, 4 November 1970, p. 13.
- 162 *Travel Digest*, op. cit.
- 163 *NZE*, Vol. 21, 1966, p. 69.
- 164 *AJHR*, 1950, D. 1, p. 69.
- 165 *Ibid.*, 1956, D. 1, p. 25.
- 166 *Ibid.*, 1968, D. 1, p. 43.
- 167 *Ibid.*, 1954, D. 1, p. 8.
- 168 *Ibid.*, 1965, D. 1, p. 4.
- 169 *NZE*, Vol. 16, 1961, p. 273.
- 170 *NZE*, Vol. 16, p. 278, Fyson, J. H., 1961, "Earthworks for Wellington Airport".
- 171 PW 23/381/18, for example, 8 and 10 December 1955.
- 172 PW 23/381/18/7, Part 1, for example, 23 and 30 September and 3 October 1955.
- 173 *Ibid.*, for example, 13 June 1956.
- 174 *The Standard*, 1 August 1956, p. 1.
- 175 PW 23/381/18/7, Part 1, 22 March 1956.
- 176 *Ibid.*, 9 April 1956.
- 177 For details see *AJHR*, 1960, B. 1 [Pt. II], p. 48, *ibid.*, 1961, pp. 42, 43, and 60, and H. 14, p. 18; also Wellington newspaper reports October, November, December 1960, 7–11 February and 6, 13 March 1961.
- 178 Carrie, I. M., A preliminary note concerning the desirability of restructuring the formal organisation of the Head Office of the Ministry of Works, research essay, unpubl. V.U.W., 1969, p. 9.
- 179 For a full discussion of the Ministry of Work's views see *AJHR*, 1958, D. 1, p. 17 et seq.
- 180 *AJHR*, 1961, D. 1, p. 13.
- 181 *Ibid.*, 1958, D. 1, p. 19.
- 182 *Ibid.*, 1965, D. 1, p. 6.
- 183 *Ibid.*
- 184 *Ibid.*, 1966, D. 1, p. 7.
- 185 *Ibid.*, 1962, D. 1, p. 52.
- 186 *Ibid.*, 1963 and 1964, D. 1, p. 11.
- 187 *Ibid.*, 1963, D. 1, p. 11.
- 188 Address "The Works Portfolio", by Minister of Works 6 July 1971 to Wellington Branch of the New Zealand Institution of Engineers, pp. 1 and 2. Copy in Ministry of Works Library.
- 189 *Ibid.*, pp. 8 and 9.

APPENDIX I *The Functions of the PWD/MOW**

This paper will outline the functions of the department over the past 100 years. The department has investigated, designed, constructed, and in many instances operated and/or maintained after construction, a vast number of projects all with its own forces. In other cases work has been done by contract, or been designed and constructed by local authorities, with the help of Government subsidies, but subject to the overall approval and supervision of the department.

THE MAJOR ACTIVITIES

1. *Immigration*

The department was established under the authority of the Immigration and Public Works Act 1870 and it was initially "The Immigration and Public Works Department". The first Public Works Statement, presented in the House by the Hon. William Gisborne on 27 September 1871, contained the following comment: "We regard the introduction and settlement of a suitable proportion of Immigrants in each Province as an indispensable complement to the construction of such public works as may be authorised within such Province. The one is the co-ordinate of the other, and the concurrent action of both is essential to the development of the great policy of colonisation which the Legislature has directed to be prosecuted".

The intention was to settle as many immigrants as practicable on the land which the roads and railways would open up. Newly arrived immigrants were to be employed on public works until they could get themselves established on the land or in other occupations.

Prior to the passing of the Immigration and Public Works Act 1870, immigration matters had been handled by the provincial governments, matters requiring the attention of the Central Government being dealt with by the colonial secretary, but under the authority of the Act, the first agent-general in London was appointed in March 1871, as an officer of the Immigration and Public Works Department. One of his responsibilities was the making of immigration arrangements.

It was soon realised that the administration of public works was a full-time job and that immigration would be better in another portfolio so long as there was adequate liaison between the two. The Immigration and Public Works Act 1872 provided *inter alia* that Public Works and Immigration need not be in the one portfolio. On 24 October 1872 the Hon. G. M. O'Rorke was appointed Secretary for Crown Lands and Minister for Immigration and on 29 October C. E. Haughton was appointed as Under-Secretary

*This appendix is based on a paper prepared for the author by Mr C. W. Dassler, a retired senior administration officer who had long service with the department.

for Crown Lands and Immigration—thus severing the direct involvement of the Public Works Department with immigration matters.

In the 2 years that immigration was connected with the Public Works Department it was poorly organised and little was achieved. Criticism of the way in which it was carried out was a factor in the fall of the Fox Ministry in September 1872.

2. *Railway Construction, Maintenance, and Operation*

Railway construction was a major preoccupation of the department from 1870 until well into the 1920s (see appendix IV). For a few years, sections of completed railway were maintained and operated by the Public Works Department, but following an inquiry by a Select Committee of the House, it was decided that the two should be under separate management. In 1878 the management of working railways in each island was placed under a commissioner, directly responsible to Government through the Minister for Public Works. This was the beginning of the Railways Department, but for a time the parent department was still concerned with some of the maintenance jobs on open lines (see pages 37–8). In 1880 a General Manager of Railways was appointed, but he remained responsible to the Minister of Public Works.

In 1895, when the first Minister of Railways was appointed, some thought was given to the transferring of railway construction work to the Railways Department, but in 1896 it was decided to leave this work (including improvements to opened lines) with the Public Works Department.

Although latterly railway works have been on a much reduced scale, the department has over the last 20 years completed the Palmerston North deviation, the deviation of the Hutt Valley line through the new State housing areas, and the extension of the rail link from Putaruru to Kinleith; and has commenced and carried to completion the Rimutaka Tunnel and deviation, a 4-mile connection from Te Maunga to Mt. Maunganui, 45 miles of line to connect the Tasman Pulp and Paper Mill at Kawerau to the Tauranga-Taneatua line and to the forestry town of Murupara, and the lowering of several miles of line in Hamilton involving overbridges and street works and the construction of a new rail bridge across the Waikato River.

A major work at present in hand is the construction of the 15½-mile Kaimai deviation, including a 5½-mile tunnel, just exceeding the length of the Oira and Rimutaka Tunnels.

3. *Roads (Including Highways and Motorways)*

The construction of roads was under the overall supervision and control of the department until January 1889, some of the work being done directly by the department, but a large proportion by local authorities under Govern-

ment subsidy. In January 1889, the control of road works was passed to the Survey Department, where it remained until 31 March 1901, when it was transferred to a newly-formed Department of Roads.

In June 1909, the Department of Roads was amalgamated with the Public Works Department, referred to as the "parent department".

Largely on account of the problems brought about by the advent of the motor vehicle, the Main Highways Act was passed in 1922 and came into operation on 1 April 1924. Under this Act, the Main Highways Board was set up. The board remained in office until 1954, when it was replaced by the present National Roads Board.

The National Roads Board delegates to the department the overall research, planning, supervision, construction, maintenance, and administration of State highways, with the exception of some construction and maintenance work which is delegated to local authorities; and the department is represented on the board. The department received similar delegation from the Main Highways Board, on which it was also represented.

The Main Highways Board was responsible only for State and main highways, but the National Roads Board has powers and responsibilities in the whole field of roading, including streets and county roads. (Note that motorways are included in highways.)

The workload engendered by the maintenance, construction, and overall supervision and control of State highways and in particular motorways and the associated planning, research, and design work became so great that in 1959 a separate Roading Division was established within the Ministry of Works.

4. Electric Power Supply Schemes

Here, as in the case of the railways, the department was at first responsible not just for the investigation, design, and construction of electrical generating stations, but for the construction of the main transmission lines and substations and the operation and maintenance of the completed systems up to that point. It also took a leading part in framing supply and wiring regulations for the safe use of electricity, in setting standards of voltage and frequency and in the establishment of power boards, and administered the relevant Acts.

On 1 April 1946, following the passing of the Electricity Act 1945, the State Hydro-electric Department (now the New Zealand Electricity Department) came into being. This new department assumed responsibility for the operation and maintenance of completed power schemes, including the installation of machinery and transforming equipment at the power site, and for the construction of transmission lines and main substations. It also took over from the Public Works Department the administration of Acts

relating to the supply and distribution of electrical energy and the electrical wiring of premises.

For a short time it was responsible for the design of new hydro-electric works and a section of the civil engineering design staff of the Public Works Department was transferred for this purpose, but it was later decided that it would be more satisfactory for the design as well as the construction of these works to be under the control of the Public Works Department and the Civil Design Section of the State Hydro-electric Department was transferred back as from 1 April 1948.

The first Government hydro-electric scheme for general reticulation was Lake Coleridge, which was officially opened in 1914. Then followed Mangahao (1924), Arapuni (1929), and the first stage at Lake Waikaremoana (1929). Development was slow in the next 20 years. Power stations completed during this time were Waikaremoana Lower Development (1943), Upper Development (1948), Karapiro (1947), Waitaki Hydro (1935), Cobb River (1944), and Highbank (1945)—dates given being when power was first supplied.

Then began the great hydro-electric era, lasting for 20 years, when a vigorous effort was made to meet the normally growing demand for electrical energy and to overtake the backlog which had developed over the war and immediate post-war years.

On the Waikato River, Maraetai produced power in 1952, Whakamaru in 1956, Atiamuri in 1958, Waipapa and Ohakuri in 1961, and Aratiatia in 1964, completing the chain of eight stations below Lake Taupo. Matahina on the Rangitaiki River came into service in 1966.

In the South Island, Lake Tekapo came into operation in 1951, Roxburgh on the Clutha in 1956, Benmore on the Waitaki in 1965, Aviemore, also on the Waitaki, in 1969, and Manapouri—Te Anau in 1969. Various works to provide additional water storage were also constructed.

In addition to the above, geothermal power was harnessed at Wairakei, stage I joining the grid in 1958 and stage II in 1962. A coal-burning steam plant at Meremere near Mercer came into production in 1958 and an oil-burning steam plant at Marsden Point near the oil refinery in 1967. Then came an oil or gas turbine plant at Otara near Otahuhu, the first stage of which produced power in 1968.

A large oil or gas-fired steam station is under construction at New Plymouth and (in the hydro-electric field), complex schemes under construction are the Tongariro and the Upper Waitaki developments and the peak-load station Maraetai II is approaching completion. Numerous other hydro schemes have been investigated.

A separate Power Division within Ministry of Works was established in 1959.

5. *Public Buildings*

The construction of public buildings was not originally under the department, but during 1873 the branch of the service known as that of Public Domains and Buildings, headed by the colonial architect, was transferred to its control.

The construction (and maintenance) of public buildings has over the years been one of the main activities of the department, apart from a brief period of about 18 months from 1 January 1889 when, as part of a transfer of activities connected with the proposed abolition of the department—buildings were taken over by a branch of the Defence Department.

The department has designed and built (usually by contract) public buildings of all kinds—schools, colleges, university buildings, hospitals and associated buildings, dental clinics, post offices, telephone exchanges, police stations, courthouses, prisons, departmental office buildings, mobilisation camps and permanent barracks, messes, workshops, stores, offices, hangars, etc., for the armed services, many specialised buildings such as the Government Printing Office, Wellington, the Meteorological Office, Kelburn, Forestry Research Station, Rotorua, Combined Laboratory, Ruakura, Milford Hotel; multi-storey State flats.

In 1945, the Architectural Branch was constituted a separate division of the department.

6. *Housing*

In 1935 the construction of State rental housing became a major Government activity. The Public Works Department carried out site development (clearing and levelling, roading, footpaths, kerbing and channelling, storm water and sanitary drainage, water reticulation) for the Housing Construction Department. During 1945, Housing Construction became a division of the department, which then became responsible for land purchase and housing construction as well as for site development.

During the war years, practically all the manpower of the Housing Construction Department was diverted to defence works, but with the tapering off of the defence programme towards the end of 1943, the housing construction programme again got under way, although it was at first hampered by shortages of materials and manpower. In the 5 years ended 31 March 1950, 16,990 dwelling units were completed and handed over, an average of 3,398 per annum. (In 1948–49, 4,193 were handed over, and in 1949–50, 4,007.) During the decade 1951–60, 29,562 units were completed and in the following decade, with the post-war shortage of housing being overtaken, 20,745 were completed. Housing is still a major activity of the department, although at a somewhat lower level than in the past.

7. Miscellaneous Construction Activities

The following is a list of miscellaneous works in which Ministry of Works has been engaged at some time. They give some idea of the diverse nature of its activities.

River control, soil conservation (including development of aerial farming techniques), drainage works, irrigation schemes, water supply schemes, sewerage schemes, lighthouses, unwatched lights, wharves, harbour works generally, sand dune reclamation, land clearing and improvement, construction of civil and military airfields and associated works, development roads, opencast coal mining, water races on goldfields, mobilisation camps, permanent defence establishments, natural gas treatment plant, and high-pressure pipeline.

8. Maintenance and Operation of Completed Works

The department maintains buildings and installations on behalf of other departments. This includes public buildings and defence establishments (both major tasks), lighthouses, irrigation schemes (operation and maintenance), and a host of minor works of all descriptions. An idea of the great diversity of this kind of work and of minor new works will be gained from the following examples: the maintenance of public memorials (e.g., the Savage and Massey Memorials, the Coates Memorial Church, the Tangiwai Memorial), the maintenance of servicemen's cemeteries, work associated with Royal visits, the opening of Parliament and other State functions, minor works at Mt. Bruce native bird reserve and at Tongariro hatchery, restoration and maintenance of national historic places (e.g., Pompallier House, Russell; Old St. Pauls, Wellington), desilting of the caves at Waitomo, the transport of screens and ballot boxes for the Department of Justice, remedial burning at Gisborne Airport, the construction of a bridge over the Mangawhero River for the Tongariro National Park Board, the overhaul of a generating set at Somes Island, the provision of a prefabricated building for Campbell Island, the construction of access roads to microwave sites for Post and Telegraph Department, the grading of an airstrip at Mawheraiti State Farm (West Coast) for Lands and Survey Department, the investigation of proposed aerial passenger ropeways in the Mt. Cook region, the provision of water supply for motels at the Hermitage, fencing the entrance to a cave with rock paintings near Duntroon, widening and strengthening a bridge on the Milford Track, the construction of an illuminated fountain in Queenstown Park, the prefabrication and erection on site of accommodation for Scott Base.

The Ministry Of Works acts as the servicing organisation to Government departments generally. The majority of the large construction programmes

in which it engages are in the final analysis a service to other departments, Government corporations, or statutory bodies.

9. *The Department's Role in National Disasters*

The department has a nation-wide organisation of staff, manpower, and equipment, so that local forces can quickly be deployed in the event of a national disaster and assistance from other areas can rapidly be made available.

It is primarily concerned with the restoration of services and the rehabilitation of damaged areas.

Major disasters where the department has been concerned include the Napier, Murchison, and Inangahua earthquakes, the Esk Valley flood in 1938, and the Frankton tornado in 1948.

Today, the department is an essential part of the civil defence organisation, its official policy in the event of a national disaster being:

- (a) To safeguard and restore essential Government services.
- (b) To assist local authorities if requested by them to do so.
- (c) To act in the absence of organised civil defence (this would be in conjunction with Police and other departments).
- (d) To follow up and assist in co-ordinating rehabilitation of damaged areas.

10. *Relief of Unemployment*

Throughout its existence, the department has been a major Government agency for the relief of unemployment. It has had the wide-spread organisation and the means to provide "relief works". It acted in this way during the depression of the 1880s.

In the early 1920s certain railway works of *secondary* importance were carried out to relieve unemployment, and unemployed were also engaged on road and irrigation works of primary importance.

The provision of relief works has in general been a recurring minor activity of the department, frequently to assist with purely local or seasonal shortages of work; and because of the wide-spread nature of its operations, it has usually been possible to provide work of a productive nature, although low-priority works have often had to be advanced.

The depression of the 1880s and the short one of the early 1920s have already been mentioned. Much more serious was the great depression from 1930 to 1935. During these years the provision of works for the relief of unemployment gradually became the predominant activity of the department. (At the end of 1935, 13,696 men were employed on public works, of whom 8,289 were on relief works.) The depression had by then begun to

lift, additional standard public works were opened up in various areas, and relief works were progressively phased out.

Even in these days of full employment, the department is occasionally called upon to assist by providing employment to relieve short-term local shortages of work.

11. *The Department in War Time*

In time of war, the department has become involved in two main spheres of activity:

- (a) The construction of accommodation and other facilities required in New Zealand for the mobilisation and training of armed forces personnel and for the defence of the country.
- (b) The provision of the bulk of the engineering and construction staff for specialist overseas engineering units.

In the First World War the department was mainly concerned with the erection of buildings and provision of services for army training camps. Apart from enlistments in the various services, officers for the New Zealand Tunnelling Company, a specialist unit formed for service in France, as well as a considerable number of tunnellers, were drawn from the department.

The department became much more heavily involved in the Second World War. Major training establishments for the armed services, especially the army and air force, were urgently required; and the air force requirement included the establishment of permanent stations with airfields, hangars, stores, workshops, messes, barracks, office accommodation, etc., as well as emergency landing grounds in numerous localities.

Extensive accommodation, including stores, hospitals, and convalescent depots, had to be provided for the United States forces encamped here and numerous defence works were undertaken, both in New Zealand and in the Pacific area.

Employees of the department served in the armed forces and in addition the greater part of the personnel of four specialist army engineering companies mobilised by the department by arrangement with army headquarters, were recruited from staff and workmen of the department. The department also called for volunteers and selected the personnel for two aerodrome construction squadrons, which were largely composed of departmental employees. A special civilian construction unit was also formed with departmental personnel (see page 175).

12. *Building Control*

During the 1939-45 war, building control emergency regulations were necessary. In order to ensure that, in the difficult post-war conditions, certain classes of constructional work should be pursued in preference to others

considered of lesser importance to the national economy, these regulations remained in force and were administered by the department. They were progressively relaxed and the last controls by the State were removed in December 1956. However, there has since then been at times a reimposition of some form of building control because of economic difficulties and these also have been administered by the department.

13. *Works Programming*

The need for some form of works programming has always been recognised by the department but little was done until after World War II.

1947 marked the beginning of long-term programming, which has assumed increasing importance year by year and is now (1971) prepared each year on a 5-yearly forward basis, with projections for even further ahead. The works programme of State and State-subsidised works is prepared each year by the Ministry of Works in consultation with Treasury and with other Government departments where necessary and approved by Government. The programme must suit the needs of the departments and other bodies whose works requirements are included in it, and at the same time be capable of attainment with the available resources of finance, materials, and manpower involved.

14. *Inspection of Machinery*

The responsibility for this work alternated for a long time between the Public Works and Marine Departments. The Inspection of Machinery Act 1874 was administered by the Public Works Department until October 1880, when it was transferred to the Marine Department. In December 1892 the responsibility for this work (together with the survey of steamers under the Shipping and Seamen's Act 1877) again came under the department. In 1894 the survey of steamers went back to the Marine Department, and in 1898 the inspection of machinery was finally transferred back to it.

15. *Inspection of Tramways and Trolley Buses*

The department administers the Tramways Act 1908 (earlier Acts were 1872 and 1894), although it was not until 1911 that supervision of the use of electricity as a motive power under the Tramways Act was taken over by the department. This work was at one time an important function, involving mechanical and electrical inspection of public tramways and rolling stock, and the investigation of accidents. Public tramway systems have now gone out of use, one remaining being the cable car in Wellington.

The Tramways Amendment Act 1920 also brought private tramways under the provisions of the Public Works Act relating to the inspection of tramways and the powers to postpone their opening or working. This amendment was

brought in mainly to give some measure of control over bush tramways, authorising their inspection should a request to do so be received from any interested party. Bush tramways have now also largely gone out of use because of changed logging and milling practices.

The department at present carries out regular electrical inspections of public trolley buses on behalf of the Transport Department, as required by regulations made under the authority of the Transport Act.

16. *Motor Transport: Licensing, Heavy Traffic Licensing Fees, Traffic Control*

In the 1920s the Public Works Department was charged with the administration of regulations, made in 1925, fixing heavy-traffic fees, classifying roads, and containing other road-protective measures; and also with the administration of the Motor-omnibus Traffic Act 1926, whereby motor-omnibus competition with tramways was regulated. The Motor-vehicles Act 1924 provided *inter alia* for the control and regulation of motor traffic, and this was at first administered by the Internal Affairs Department; but about 1927 its administration was transferred to the Public Works Department, which proceeded to draw up in draft form regulations containing one uniform code of rules for motor traffic throughout the country. These came into effect in 1928.

The first traffic inspector to regulate traffic on the main highway between Auckland and Hamilton was appointed by the Main Highways Board in 1929, and over the following years further appointments were made and groups of local authorities were encouraged to combine for the purpose of administering the traffic regulations, the wages and expenses of traffic inspectors employed by them being subsidised by the board. Apart from full-time inspectors, a number of departmental officers controlling certain sections of highway were vested with the powers of a traffic inspector for the purpose of general traffic supervision.

This situation continued until 1 April 1937 when, as a result of the Government's proposals for more intensive enforcement not only of the general traffic regulations, but also of the conditions governing licensed transport services, all traffic control outside of municipalities having a population in excess of 6,000 was placed under the jurisdiction of the Commissioner of Transport.

17. *Town and Country Planning*

The Town Planning Act 1926 was administered by the Department of Internal Affairs until 1946 when its administration was transferred to the Ministry of Works. The Town and Country Planning Act, much wider and more comprehensive in its scope than the 1926 Act, was passed in 1953.

Its object was to encourage local authorities to prepare town and country planning schemes, the tenor of the legislation being to vest in the local bodies full authority and responsibility for planning, subject only to the preservation of rights of appeal and co-ordination of schemes through the Central Government.

The Act is administered by the department, which is also responsible for co-ordinating the proposals of all State departments in any particular area and keeping the local authorities concerned fully acquainted with State activities. The department also provides a general information and technical advisory service in respect of town planning matters to local authorities and other Government departments and is the principal adviser to Government on town and country planning matters.

The basic function of the Town and Country Planning Branch of the department is the administration of the Town and Country Planning Act, the principal aspect being the examination and review of district planning schemes, to ensure that existing and proposed Government works are provided for in district schemes and that these and other development proposals accord with sound principles of planning and that the public interest is adequately safeguarded.

The Research Section has published five volumes of the National Resources Survey (West Coast, Bay of Plenty, Northland, Nelson, and Otago) and two further volumes are virtually complete. Population estimates are an essential factor in forward planning and the branch is continually engaged in revising and updating these estimates for the assistance of local authorities, Government departments, and other planning agencies.

The branch also undertakes research into a wide variety of planning issues and is represented on many Government committees dealing with land use and development and environmental questions (for instance, during 1969–70, the Air Pollution Committee, Wairakei Tourist Park Committee, Taupo Basin Co-ordinating Committee, Mt. Cook Development Committee, Advisory Working Committee to the Committee of Inquiry into Public Passenger Transport, and the Queenstown Inter-Departmental Committee).

The branch has recently been expanded by the addition of an Environmental Design Section to serve the department generally and also to assist local authorities.

18. *Land Purchase and Legal Work*

Land purchase and legal work undertaken by the department was at first mainly associated with the acquisition, under the Public Works Act, of land required for roads, railways, and public buildings; and the services of the department's specialist staff were made available to other Government departments and to some extent to local authorities.

With the extension of the department's activities over the years to many other classes of public works (especially in recent years to motorway construction in urban areas) the work of these two closely associated sections has been expanded greatly. As well as being responsible for land transactions related directly to its own construction programme, the department, with few exceptions, negotiates the purchase of land for all Government departments. Also, where land belonging to the Crown is no longer required for its original purpose, the department ascertains whether there is any other Crown requirement before it is disposed of. In cases where the Crown is providing the whole or a substantial part of the cost of any land to be purchased (e.g., in the case of hospital boards, education boards, and sometimes local authorities), the department also arranges the purchase.

It will also act for Government corporations and other Government-sponsored bodies if they so request (e.g., it negotiates land purchases for the Tourist Hotel Corporation).

19. Water and Soil Conservation and Rivers Control

The department has been concerned with river control, both generally and in particular cases for the protection of works such as roads and railways, from the early 1870s. The first large-scale work, undertaken by the department in 1912, was the scheme for improvement of the channels of the Waihou and Ohinemuri Rivers flowing through the Hauraki Plains. Work to control the Taieri River was started in 1925 and to control the Northern Wairoa in 1926. Other schemes carried out in the 1930s and early 1940s included control works on the Ngaruroro, Tutaekuri, Karamea, Arahura, Ashley, Ashburton, Hinds, and Opihi Rivers and willow clearing on the Hoteo (North Auckland), Mokau, Mokauiti, Ohura, and Wanganui Rivers.

Some of these schemes were done as "relief" works, but they evidenced the growing concern being felt over the palpable increase of soil erosion in the high country and flood damage to fertile land at lower levels. This growing concern culminated in the passing of the Soil Conservation and Rivers Control Act in 1941. Under this Act, the Soil Conservation and Rivers Control Council was set up to deal with the problems of exhausted soils on hill country, deteriorating pastures, widespread soil erosion, increasing run-off, and the associated mounting damage to the lowlands by flooding and river erosion.

The Act was at the time considered to be one of the most advanced Acts of the type anywhere in the world, bringing together soil conservation, river control, and drainage problems under unified control both at national and district levels.

The department is represented on the Soil Conservation and Rivers Control Council and on catchment boards and commissions; and it provides a

central engineering, research, and administrative service to the council. The majority of soil conservation and river control works are carried out by the catchment boards and commissions, which have rating powers and also receive subsidies from Government; but the department does work directly in those parts of the country not in a catchment area or district and administers the council's soil conservation reserves.

The Water and Soil Conservation Act 1967 came into force on 1 April 1968. Under this Act, which was designed to promote a national policy in regard to all aspects of the administration of water and soil conservation, the Soil Conservation and Rivers Control Council became part of the national water and soil conservation organisation, the newly constituted National Water and Soil Conservation Authority being the overall controlling body on matters of general policy.

The department provides engineering, research, and administrative services to the National Water and Soil Conservation Authority as to the Soil Conservation and Rivers Control Council, the overall amount of work involved being such that a separate Water and Soil Conservation Division has been created within the framework of the department.

The department also administers the Waikato Valley Authority Act 1956. The Waikato Valley Authority was set up to examine and co-ordinate river control and soil conservation works proposed to be carried out by the various local authorities on the lower Waikato River and the Waipa River and its tributaries. It is responsible to the Minister of Works and all proposals which it recommends require to be referred to the Ministry of Works for technical and financial approval before they can proceed. The department is represented on the authority.

20. Stores Purchasing

The department has a large organisation responsible for the purchase, custody, and issue of stores and materials needed for its own construction and maintenance work, and the services of this organisation are made available to other departments and to some other bodies.

This was an early activity of the department. The 1894 report of the engineer-in-chief refers to contracts entered into for the supply and delivery of general stores, tents, etc., for public works for the year 1894 at Auckland, Wellington, Wanganui, Christchurch, Dunedin, and Invercargill; and the following year's report refers to tenders being accepted for the supply and delivery for the year of general ironmongery and other stores for the Public Works, Railway, and other Government departments.

Today the department's Stores Branch is the official Government purchasing agency throughout the country for most departments and large

demands are made on it by Education, Police, Maori and Island Affairs, Lands and Survey, and the armed services. Very substantial major requirements are handled for the armed services, including clothing (procurement of cloth and the arrangement of cut, make, and trim) and footwear contracts.

Since 1963, the department has been the official purchasing agency in New Zealand for the Government of Western Samoa.

Purchasing in connection with the Colombo Plan aid programmes is undertaken by the department and at Auckland an export consolidation and shipping service is organised to ensure that New Zealand's contribution is adequately packed and protected. The Stores Branch helps to train officers from overseas Governments in supply and associated procedures.

Another activity, as agent of the Government Stores Board, is the organisation of auctions at major centres of surplus materials and customs seized goods.

The department is represented on the Government Stores Board and on the Government Stores Board Advisory Committee and other associated committees.

SOME OTHER ASPECTS OF THE DEPARTMENT'S ACTIVITIES

1. *Cabinet Works Committee*

The Cabinet Works Committee, as its name implies, is a committee of Cabinet set up to consider "works" matters. Subject to the overriding control of Cabinet, it approves in principle the programme of State and State-subsidised works as prepared by the department. Following this approval in principle and the passing by the House of the annual estimates of expenditure, specific approvals are required before new works can be undertaken. Smaller works are approved by the Ministers concerned under their delegated authority, but larger ones require the approval of Cabinet Works Committee. The department and Treasury report on all submissions to the Cabinet Works Committee seeking specific financial approval to works projects; and two senior officers of the department attend all meetings of the committee in an advisory capacity.

2. *Local Authorities Loans Board*

In his 1924 statement, the Minister expressed concern at the evident need for some check as to the general engineering and economic soundness of development proposals put forward by local authorities and suggested that provision should be made whereby no local authority might proceed with the raising of a loan until the proposal concerned had been first submitted to experts for investigation, in order to ascertain whether: (a) the work proposed was sound from an engineering point of view; (b) it was

justified at the cost estimated, having regard to existing services; (c) it was economically sound, having regard to its value to the district concerned and the capacity of the district to pay for it; and (d) (if applicable) that it fitted in and formed part of a comprehensive plan of relative works.

This led the Government to pass the Local Government Loans Board Act 1926.

Today, the department reports to the Local Authorities Loans Board on all engineering works and buildings proposed to be financed by local authorities from loan moneys. In respect of buildings, electrical, mechanical, and associated services are checked and reported on as well as architectural and structural design. A considerable amount of work is involved in reporting on hospital building proposals (hospital boards are in some respects classed as local authorities). The department is represented on the Loans Board.

3. Acts Administered by the Department

The department administers and derives its authority from a number of Acts. It is not intended to list all of these, but the following schedule gives an indication of the scope and diversity of its activities:

The Public Works Act 1928; the Ministry of Works Act 1943; Finance Act (No. 3) 1944, Part VI (deemed to be part of the Public Works Act); the Water and Soil Conservation Act 1967; the Soil Conservation and Rivers Control Act 1941; the Waikato Valley Authority Act 1956; the Underground Water Act 1953; the Waters Pollution Act 1953; the National Roads Act 1953; the Geothermal Energy Act 1953; the Town and Country Planning Act 1953; the Housing Act 1955 (part only); the Tramways Act 1908; the District Railways Act 1908; the Local Railways Act 1914; the Auckland Harbour Bridge Act 1950; the Christchurch-Lyttelton Tunnel Act 1956; the Engineers Registration Act 1924; the Engineering Associates Registration Act 1961.

4. Statutory and other Bodies on which the Department is Represented

The department is represented on a great number of statutory and other bodies of which the following are examples:

National Roads Board, Soil Conservation and Rivers Control Council, Water Pollution Control Council, Water Allocation Council, Waikato Valley Authority, Local Authorities Loans Board, Hospital Works Committee, Hospitals Advisory Council, University Works Committee, Timber Preservation Authority, Clerk of Works Registration Board, Architects Education and Registration Board, Engineers Registration Board, Engineering Associates Registration Board, New Zealand Historic Places Trust; Civil Defence: National Civil Defence Committee, National Plans Co-ordinating Committee, Planning Committee for Restoration, Recon-

struction, and Rehabilitation after Disasters, and other Committees; Sector Councils of the National Development Council: (Fuel and Power Council, Tourist Development Council, Building Industry Advisory Council, Mineral Resources Council, Transport Advisory Council, Environmental Council); New Zealand Road Safety Council, New Zealand Society for Earthquake Engineering, Planning Committee on Electric Power Development in New Zealand, Working Group of the South Pacific Air Transport Council; Standards Association of New Zealand Standards Council, and a great number of project and sectional committees of the Standards Association; New Zealand National Committee for the International Hydrological Decade (1965-74), Tourist Facilities Development Committee, Committee of Management of the Tussock Grasslands and Mountain Lands Institute, Inter-departmental Fuel and Power Committee, Inter-departmental Committee on Irrigation, Inter-departmental Committee on Pollution of the Environment, Inter-departmental Committee on Utilisation of Organic Wastes, Inter-departmental Committee on Fire Protection, Inter-departmental Committee for the West Coast, Chatham Islands Inter-departmental Advisory Council, Taupo Basin Co-ordinating Committee, Committee on Auckland Rapid Transit Proposals, Capital City Planning Committee, Teachers Colleges Works Committee, Technical Institutes Works Committee, Government Office Accommodation Board, Government Stores Board, State Services Housing Committee.

Departmental representation on almost all of these bodies is by head office personnel because of their national character, but district office staff also represent the department on a great number of similar or related bodies of more regional or local character. These include civil defence committees, catchment boards and commissions, district associations of the New Zealand Historic Places Trust, district roads councils, district road safety committees, and many regional planning authorities. Among other local organisations on which the department is, or has recently been, represented could be mentioned the Kaitaia Drainage Committee, Auckland International Airport Committee, Auckland Air Pollution Research Committee, Civic Centre Technical Advisory Committee (Auckland), Geothermal Technical Committee (Rotorua), Inter-departmental Committee on the Development, Utilisation, Drainage, and Flood Protection of Peatlands (Waikato), Tongariro Advisory Committee, Turangi Liaison Committee (Advisory Body on Local Government Affairs), Technical Co-ordinating Committee Wellington-Hutt Motorway, Land Utilisation Committee (Masterton), Winchmore Irrigation Research Committee, Taieri River Trust, Inter-departmental Committee—Queenstown Area, Waitaki Lakes Committee, Lake Tekapo Town Planning Board.

Many of the bodies mentioned above also have technical and/or working committees on which the department is represented.

5. *Technical and Advisory Services*

Some of the more important activities of the department have been dealt with in a little detail, but over and above all these is the general technical and advisory service which it provides to Government, to other Government departments and in certain circumstances to Government corporations, Government-sponsored bodies, and local authorities. To quote just a few examples, a senior engineer of the department is marine works engineer; the department acts as civil engineering consultant to the New Zealand Electricity Department; it designed and constructed the Kaitoke waterworks for the Wellington water supply, designed and supervised the construction of the Christchurch-Lyttelton Road Tunnel, and provided a civil engineering advisory and inspection service to the Post Office on the design and construction of the Warkworth Satellite Earth Station; it drilled geothermal steam test bores at Kawerau for the Tasman Pulp and Paper Mill and has since given technical assistance and advice; and the department's general laboratory services are available to other Government departments and where appropriate to local authorities.

APPENDIX II *Some Early Public Works Personalities**

HUNTLY JOHN HARRY ELIOTT. *First Chief Clerk*

H. J. H. Eliott in October 1870 as the Chief Clerk was one of the first to take up duty in the newly constituted Public Works Department. He was born in Auckland on 10 May 1843, the son of George Eliot Eliott, who in that year became Record Clerk in the Colonial Secretary's office in Auckland, and who in September 1862 became Secretary to the General Post Office. Huntly Eliott commenced his long public service career on 1 October 1858 as a clerk in the Colonial Secretary's Department in Auckland. It is of interest that at the age of 15½ his starting salary of £60 (\$120) per year was 50 percent more than the £40 (\$80) offered cadets in the first 10 years of this century. He was promoted to Record Clerk on 1 January 1866 at a salary of £200 (\$400) and on 1 October 1870 became Chief Clerk of the Public Works Department at a salary of £300 (\$600) (12 years service, age 27½).

With the setting up of a separate Immigration Department on 1 March 1873 Eliott was transferred and appointed Chief Clerk at a salary of £350 (\$700), which on 1 July following was increased to £375 (\$750). Concurrently he held the position of Immigration Officer, Wellington. It is noticed that Eliott's successor as Chief Clerk in the P.W.D., C. T. Benzoni, (q.v.) age 38 and with just over 3 years service, was appointed at £250 (\$500). Four years elapsed before his salary reached £375.

On 1 July 1877 Eliott was appointed Assistant Under-Secretary of Crown Lands and Assistant Under-Secretary for Immigration, at a combined salary of £400 (\$800). A year later he became Under-Secretary of each department, the combined salary being £500 (\$1,000). From 1 April 1883 the two offices were combined under the title Under-Secretary Crown Lands and Immigration with a salary of £600 (\$1,200).

April 1891 saw the amalgamation of the Crown Lands and the Survey Departments. For some time mining activities had been administered by the Crown Lands Department, but these now became the responsibility of a separate department with Eliott as Under-Secretary for Mines.

When nearly 63 he retired in March 1906 after a continuous and honourable career of 47½ years in various departments of the service. The son of one of New Zealand's first public servants, he himself was one of our first native born officers.

*These biographies were prepared for the author by J. H. Christie. Copies with references are held in Ministry of Works Central Library.

JOHN KNOWLES. *First Under-Secretary for Public Works*

Born in London on 4 December 1823, and educated there, John Knowles was in the service of the New Zealand Company as a storekeeper and clerk before coming to New Zealand in the *Gertrude*. From 1 November 1841 he was employed as clerk to the Principal (presumably of the Company) in Wellington, initially at £80 per year. In October 1844 this service terminated owing to the suspension of the Company in New Zealand. He then worked his passage back to England and there rejoined the Company in London on 1 January 1846 as a second-class clerk at £100 per year. At the end of 1850 he transferred to the Canterbury Association and was with them until the Association was wound up in October 1852.

In June 1856 he was appointed clerk to the Superintendent of the Wellington Province, which position he left to join the Government service in December 1869. He went to England as secretary with Featherston and Bell and returned to commence his new duties on 6 April 1871 as Under-Secretary for Immigration and Public Works at a salary of £600 per annum. He retired on pension at the end of March 1883 and died on 3 December 1891.

CHARLES THOMAS BENZONI. *Acting Under-Secretary*

Few public servants past or present can have lived the varied and exciting life of Charles Thomas Benzoni. Born in London about 1835, he was educated at a private school in St. Albans, Hertfordshire. For a time he worked with T. and T. Gates, Bât à d'or et Fabricants, de Baudruche Anglaise, in London. Later he entered the Imperial Service during the Crimean War, and was attached to the Army Medical Department. After that he was a member of Lord Elgin's expedition to China, but was wrecked in the H.M.S. *Transit* in the Straits of Sunda. Eventually the force was diverted to the Bengal Presidency, consequent on the Indian Mutiny. Benzoni was subsequently employed in China on gun-boat duties on the Canton River. Later he was present at the destruction of the forts at Taku, in the Gulf of Pi-tchi-li. Returning to England he studied in the General Surgery at Aldershot. He volunteered and proceeded to Canada with the Guards and Rifle Brigade. After returning to England he was sent to New Zealand and served with Lieutenant-General Cameron's force in the Waikato campaign. Later he followed mining and journalistic pursuits in Auckland until 1870, when he was appointed Field Quartermaster in the expedition against Te Kooti in the Patatere district.

On 20 January 1870 he commenced duty as Officer in Charge of Stores, Auckland and on 17 October following he became Chief Clerk, Stores Department, Wellington. A leading article in the *Evening Post* of 27 March

1873 contained rather trenchant criticism of his action in keeping notes about the conduct of one of his officers, the subject of an inquiry.

In the latter part of 1872 when immigration activities were handed over from the Public Works to the Crown Lands Department, the first Chief Clerk of the Department, H. J. H. Elliott, (q.v.) was also transferred. On 10 March 1873 Mr Benzoni took up his position. On 22 March 1879, he was promoted to Assistant Under-Secretary. John Knowles, the first Under-Secretary, retired on 31 March 1883, and Benzoni became Acting Under-Secretary. Later that year C. Y. O'Connor, an Inspecting Engineer who was deputy to W. N. Blair, Engineer-in-Charge of the South Island, was appointed Under-Secretary. In December 1884, Benzoni applied for 6 months leave of absence which was granted from 1 January, but on 5 February he acknowledged a letter dispensing with his services after expiration of his leave of absence.

In September 1885 Benzoni was elected a member of the Wellington City Council but he resigned in April 1887. The same year he was appointed Clerk of the Friendly Societies' Registry Office and in 1892 he became Deputy-Registrar of Friendly Societies.

HORATIO JOHN HOOPER BLOW.

Under-Secretary for Public Works 1891-1916

Born on 12 September 1855, in London, he was educated at the Arnold House School at Brighton. Brought up to a mercantile life, he later gained some experience in his father's business in London. With his father he arrived in Wellington in 1871 per ship *Celaeno*. For a time he assisted in his father's newly established leather business, and later accepted an appointment with W. J. Gandy. Then, when 2 months under 18, on 20 July 1873 he joined the Public Works Department as an extra clerk at 10/- (\$1) per day, or £143 (\$286) per year. On 1 April 1877 he became a clerk in the office of the Accountant of the Working Railways Department at £200 (\$400) per year. Nine months later he returned to the Public Works Department as Record Clerk, a position he held for 7 years.

On 1 January 1885 the Assistant Under-Secretary, C. T. Benzoni, commenced 6 months leave and Blow took up the position in an acting capacity. Shortly afterwards Benzoni received notice that his services would terminate on the expiration of his leave at the end of June. On 1 October 1885, with 12½ years service, Blow was appointed Assistant Under-Secretary, his salary the following April going to £400 (\$800) per annum.

W. N. Blair, the Engineer-in-Chief and Under-Secretary, died in May 1891 and just over 2 weeks later Blow applied for the position of Under-

Secretary, to which he was appointed in an acting capacity a fortnight later. The appointment was confirmed as from 12 October following and at the age of 36 with just over 18 years service he commenced his reign of $24\frac{3}{4}$ years as head of the Department. His salary was increased to £450 (\$900) per annum. In course of time it became "Mr. Blow's Department"; he was "Mr. Public Works".

From 1 January 1895 the Railways Department, which had been administered by Commissioners for some 5 years, reverted to the control of a General Manager, responsible to a newly appointed Minister of Railways, and Blow was appointed Under-Secretary for Railways. For this he received £100 (\$200) per annum in addition to his Public Works Department salary. How long this arrangement lasted is not clear, but neither his name nor the position appear in the staff list or the Yearbook for 1897.

In 1909 T. H. Hamer, Under-Secretary of Mines, joined the staff of the High Commissioner in London, and the office was conferred on Blow, giving him the dual duties of Under-Secretary of both Departments.

John Knowles, the first head of the Department, in a letter sent when Blow was seeking support to gain the position of Under-Secretary, said:

"You were smart, but what is of infinitely more consequence you were *thorough*—to leave a matter in your hands was to be satisfied that it would be well and promptly done."

The old-timers had memories of Blow the man. First, the painstaking thoroughness he brought to bear on everything he touched. A disciplinarian and a stickler for punctuality, his pet aversion was the officer who was always a few minutes late. "Don't mind if a man is an hour late once in a while," he would say. "He probably has a good reason for it. But these habitual late arrivals, hrrmph, hrrmph, can't stand them . . ."

Blow had a habit of clearing his throat with a nervous "hrrmph" that punctuated his conversation and spoilt his delivery as a public speaker.

His favourite outings were staff picnics. At one such he heard for the first time the undignified New Zealand rendition of his dignified Christian name. Working back together that night his secretary asked him if he had enjoyed the picnic.

"Why, yes, Thompson. Except, hrrmph, hrrmph, that a fellow who'd had too much to drink kept coming up to me and saying, hrrmph, hrrmph, 'Hello, Horokiwi!'"

In one respect Blow was ahead of his time. In an age when letters, like leaky taps, were liable to run on and on, and when even professional writers used plain words only when they could not think of fancier ones, Blow pioneered the smooth conciseness of a later generation. His letters are still models of good, clear English. He was remembered also for his competence at dictation and for his adroitness at the lost art of minute writing. Always

progressively-minded, he readily adapted to new-fangled ideas such as the typewriter and the female office worker.

Awarded the I.S.O. in 1911, Mr Blow retired, when nearly 61 and after 43 years service, on 20 July 1916. He rejoined the Mines Department as Under-Secretary from October 1917 to the end of 1919. He died at Wellington in 1933 at the age of 77.

PIERRE FINCH MARTINEAU BURROWS. *Architect*

Pierre Burrows was born on 26 July 1842. He was of Huguenot descent. His ancestors fled from France in 1685 and settled in Stoke Holy Cross, Norwich, where he was born and educated. With his brother, Arthur, he arrived at Auckland aboard the *Victory* on 4 January 1865. How he obtained his architectural training is not known. The electoral roll for Auckland West dated September 1873 shows his abode as Newton and property situated at Queen Street, Stitchbury Buildings.

Burrows was appointed to the staff of the Colonial Architect on 10 September 1874. When W. H. Clayton died in August 1877 he was the oldest member of the staff and continued in charge of the branch. When some 7 months later the operating side of the Department was divided to cover each main island separately, Burrows became responsible to the Engineer in Charge of the North Island. A staff register compiled about 1881 shows him as "Chief Draftsman; Architect N. I. Wellington." The last amount appropriated for the Colonial Architect's salary was at the rate of £900 (\$1,800) per year; for Burrows for the same year £350 (\$700). The following April Burrows' salary was increased to £450 (\$900), at which figure it remained. In February 1884 the Minister for Public Works asked the Under-Secretary "to enquire into the working of the Architects' Branch with a view to amalgamating it with [the general work of] the Public Works Department." Burrows' services were dispensed with on 31 March. He returned to Auckland and resumed private practice. In 1885 he petitioned Parliament concerning his non-appointment as Colonial Architect.

Major public buildings for which Burrows was responsible include the Supreme Court and the Mount Cook Barracks in Wellington and the Mount Eden Gaol in Auckland.

Burrows applied for re-employment in the Department in 1890 and in November 1894. On 9 May 1895 he commenced work as a temporary draftsman at Hunterville at a wage of 10/- (\$1) per day. At that time Hunterville was the headquarters office for the construction work at the southern end of the North Island Main Trunk Railway, and evidently it also serviced the Taranaki-Manawatu area. Hawke's Bay and the northern Wairarapa were

added when the Pahiatua office closed. From 1 April 1900 Burrows was designated temporary architectural assistant at £210 (\$420) per year. On 16 May 1901 he began 6 months leave without pay for the purpose of visiting England. Several extensions were granted and he resumed duty on 31 December 1902.

In February 1903 the headquarters of the Resident Engineer were shifted to Taihape. Burrows remained at Hunterville and continued to supervise architectural activities. At the end of March 1905 the office at Hunterville was closed and he was transferred to Wellington. From entries in the correspondence index it appears that he continued with the same work from there. Apparently his family had remained in Auckland because an entry refers to "removal of Mr Burrows and family from Hunterville and Auckland to Wellington".

When nearly 66 he retired on 30 June 1908 on a pension of £47 13s. 4d. (\$95.33) per year. Subsequently he lived at New Plymouth where he died on 21 April 1920. He was survived by three sons and four daughters.

WILLIAM STONHAM SHORT.

Under-Secretary for Public Works 1916-1920

Born in London on 4 September 1852 he received his earlier education there. He landed in Sydney in 1864 and after receiving further education was put to the soft goods trade in the establishment of David Jones & Co. He was subsequently employed in Farmer & Co's emporium, but after some 4 years his health failed and he was compelled to take an extended sea voyage. Traveling to China and Japan, for several years he traded as supercargo in the China Seas, afterwards living in Japan, and visiting Vladivostok, in Siberia. His health having greatly improved, Short crossed over to Wellington and almost immediately on 12 December 1874 entered the Public Works Department as an extra clerk at 10/- (\$1) per day. By July 1878 he was classed as clerk with a salary of £230 (\$460) per annum. In 1879-80 an increase was voted bringing his salary up to £255 (\$510) but this was afterwards withheld. A salary cut of 10 percent from 1 August was too much and he resigned from 31 December 1880. He accepted the position of bookkeeper with the hardware firm of John Duthie & Co. On 24 June 1882 he was reappointed to the Department at a salary of £250 (\$500), and from the following December he was clerk handling the administration of the Roads and Bridges Construction Act. On 1 April 1889 he transferred to the Survey Department, which had taken over road work from Public Works. Three years later he was appointed Chief Clerk in the Head Office of the Lands and Survey Department, a position he held until 31 December 1901.

When the Roads Department was set up on 1 April 1901 he became its Chief Clerk. On 19 November following he was admitted as a Solicitor of the Supreme Court and in 1907 he published a book *A Treatise upon the Law of Roads, Bridges, and Streets in New Zealand*. For some years this was regarded as the standard work on this subject. As well as being Chief Clerk he was also Solicitor and Commissioner for his Department.

In 1909 the Roads Department was amalgamated with Public Works and Short returned to his old Department, being appointed its Assistant Under-Secretary. On 20 July 1916, on the retirement of H. J. H. Blow he became Permanent Head of the Public Works Department, with the title of Under-Secretary. He retired on 12 May 1920 at the age of 67.

Mr Short was a man of musical tastes, and he occupied the post of organist at Trinity Wesleyan Church, Newtown, Wellington. In 1877 he was married to Miss Elizabeth Sarah Leighton, daughter of Mr John Leighton, of Nottingham. They had three daughters and six sons.

THOMAS GEORGE GORDON BECK, A.M.I.C.E., M.N.Z.I.E.*

Deputy Commissioner of Works

Born at Palmerston, Otago, 2 August 1900. He joined the Public Works Department as a cadet 4 August 1919.

Worked in North Auckland district, then at Arthurs Pass. In March 1924 he was granted leave to attend Canterbury University College and the following November he transferred to Dunedin.

Awarded a Commonwealth Fund Service Fellowship in 1931, he spent 2 years abroad, mostly in America, studying irrigation, drainage, and river control. On return he was engaged on the investigations and preliminary surveys for major irrigation works in mid-Canterbury, and subsequently was in charge of the construction of this work.

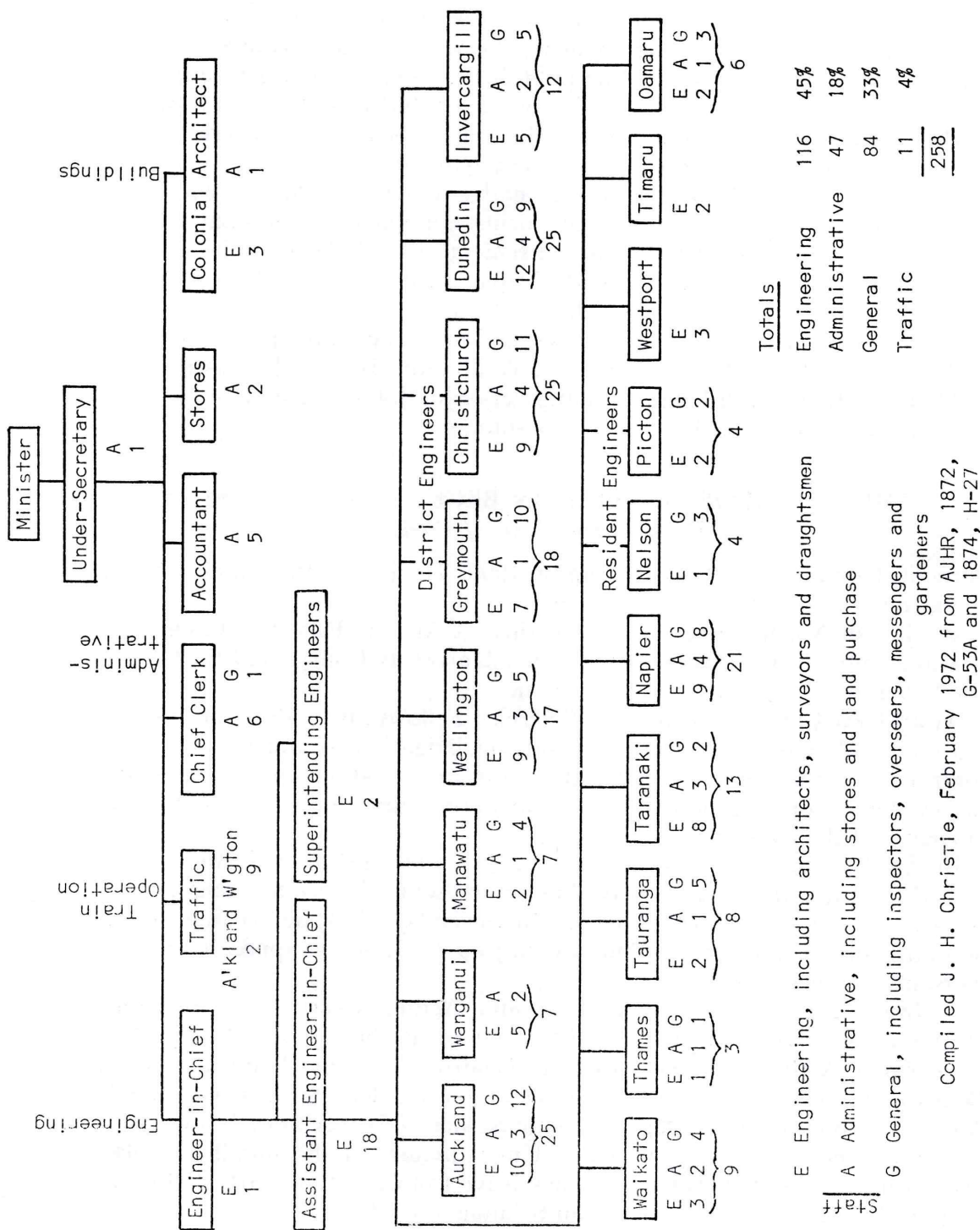
In April 1940, he became District Engineer at Christchurch and at the end of 1942 was transferred to Wellington as Acting Inspecting Engineer in connection with defence construction. In December 1943, he became Acting Second Assistant Engineer-in-Chief and in June 1945, he was appointed Acting Assistant Engineer-in-Chief.

As from 22 February 1946, Beck became Acting Assistant Commissioner of Works, and when W. L. Newnham retired at the end of March 1946, he became Acting Engineer-in-Chief, Chairman of the Main Highways Board and Chairman of the Soil Conservation and Rivers Control Council. After his appointment as Deputy Commissioner of Works from 1 July 1946, he relinquished these appointments. Unfortunately in the middle of 1945 his health deteriorated. He was on sick leave from 2 July to early 1946 and from 21 July 1947, until his death on 6 January 1948.

*Equivalent later to
M.I.C.E., F.N.Z.I.E.

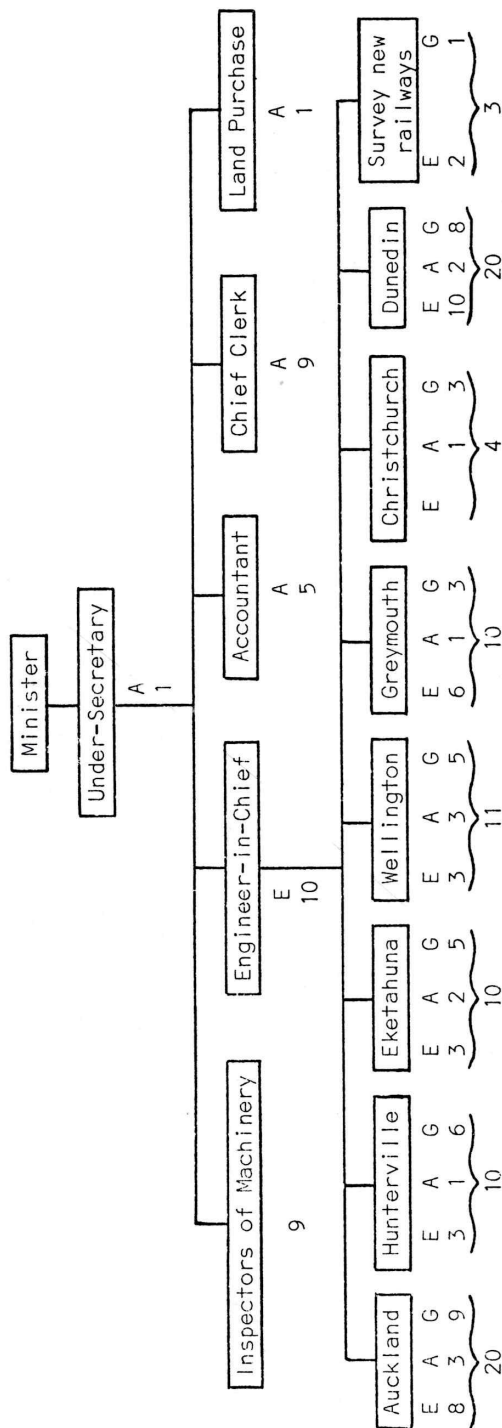
APPENDIX III *Organisation Charts. (1874, 1896, 1920, 1937, 1947, 1957, 1970)*

NEW ZEALAND PUBLIC WORKS DEPARTMENT - ORGANISATION, JULY 1874



PUBLIC WORKS DEPARTMENT

ORGANISATION CHART - FEBRUARY 1896



Hunterville included Taranaki and Manawatu

Eketahuna included Wairarapa and Hawkes Bay

Wellington included Marlborough and Nelson

- E Engineering, including architects, surveyors and draughtsmen
- A Administrative, including stores and land purchase
- G General, including inspectors, overseers, messengers and gardeners

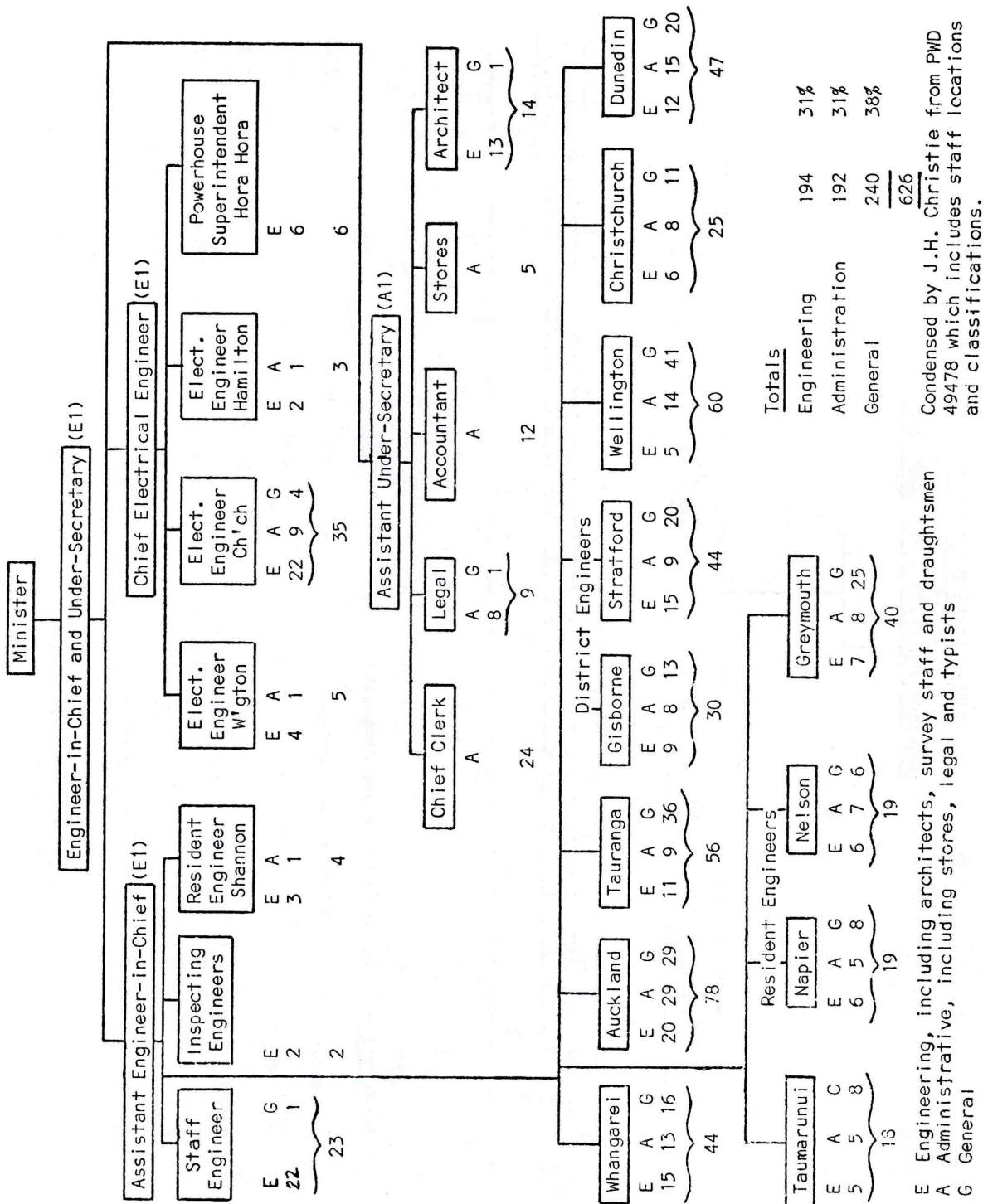
Based on list of 1896 staff in M.O.W. Library.
(from file P.W. 19/510)

Totals

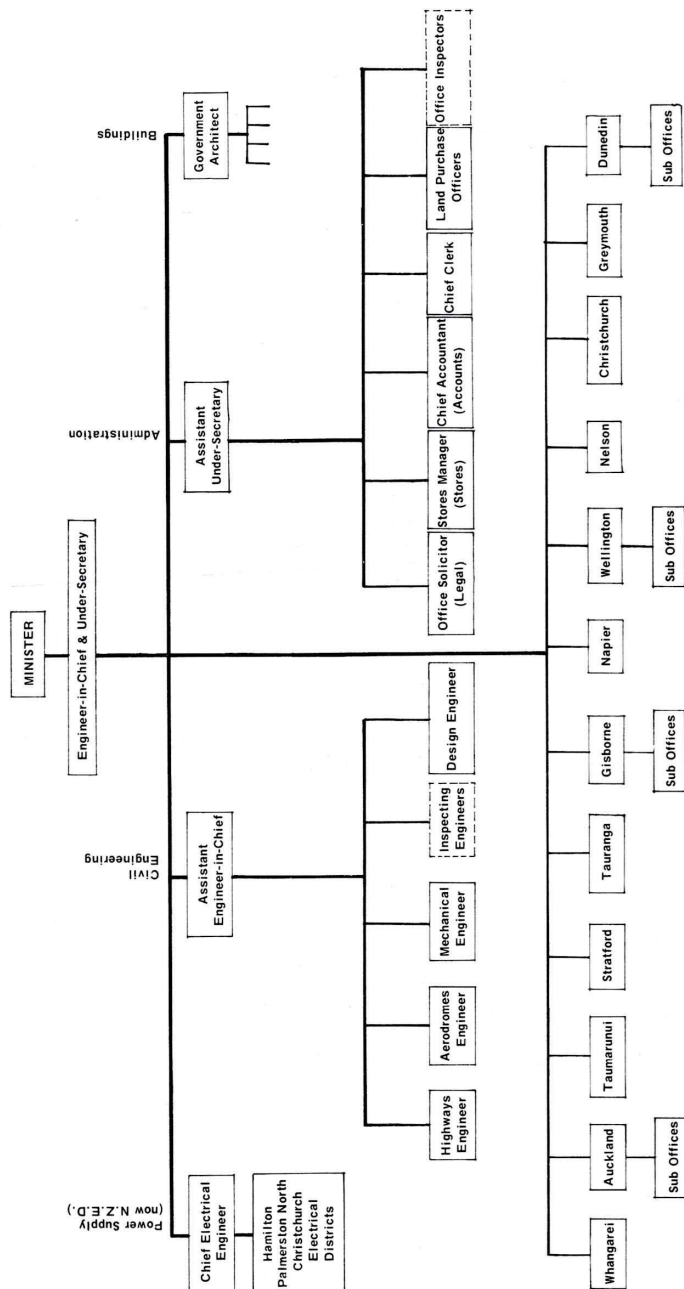
Engineering	45	37%
Administrative	29	23%
General	40	33%
Inspection of Machinery	9	7%
	<u>123</u>	

Compiled J.H. Christie, February 1972

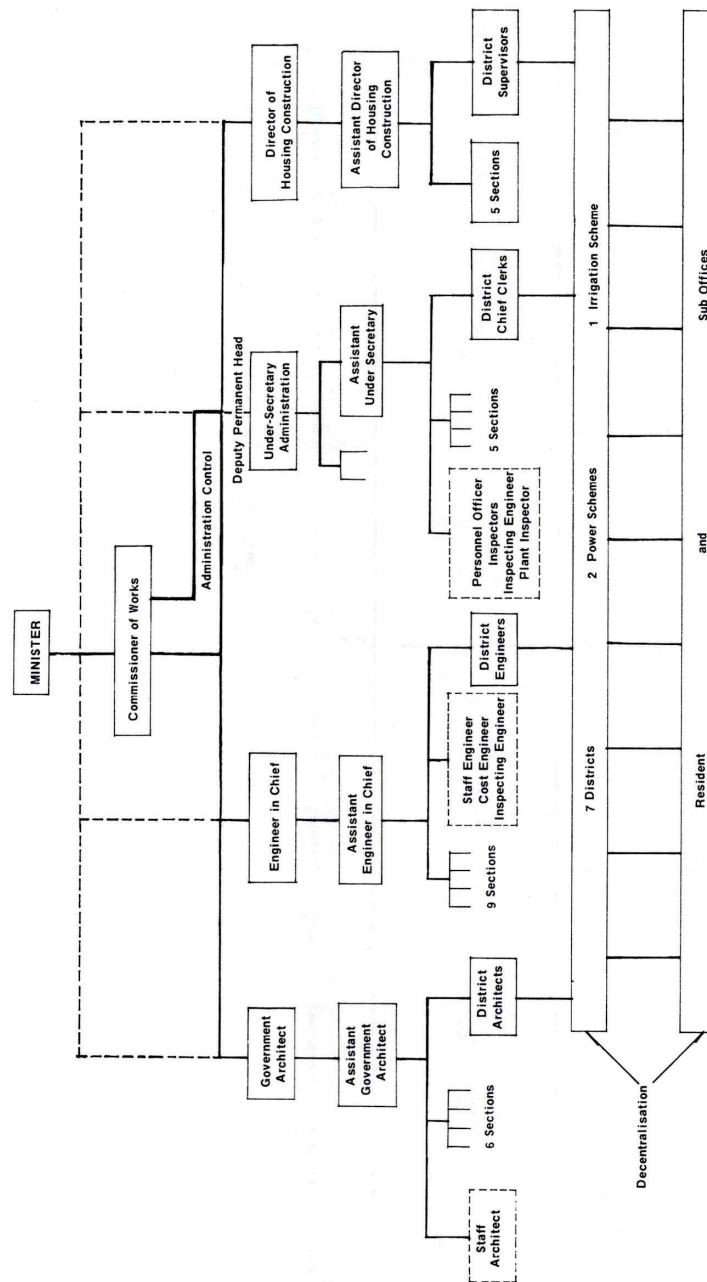
PUBLIC WORKS DEPARTMENT - ORGANISATION, APRIL 1920



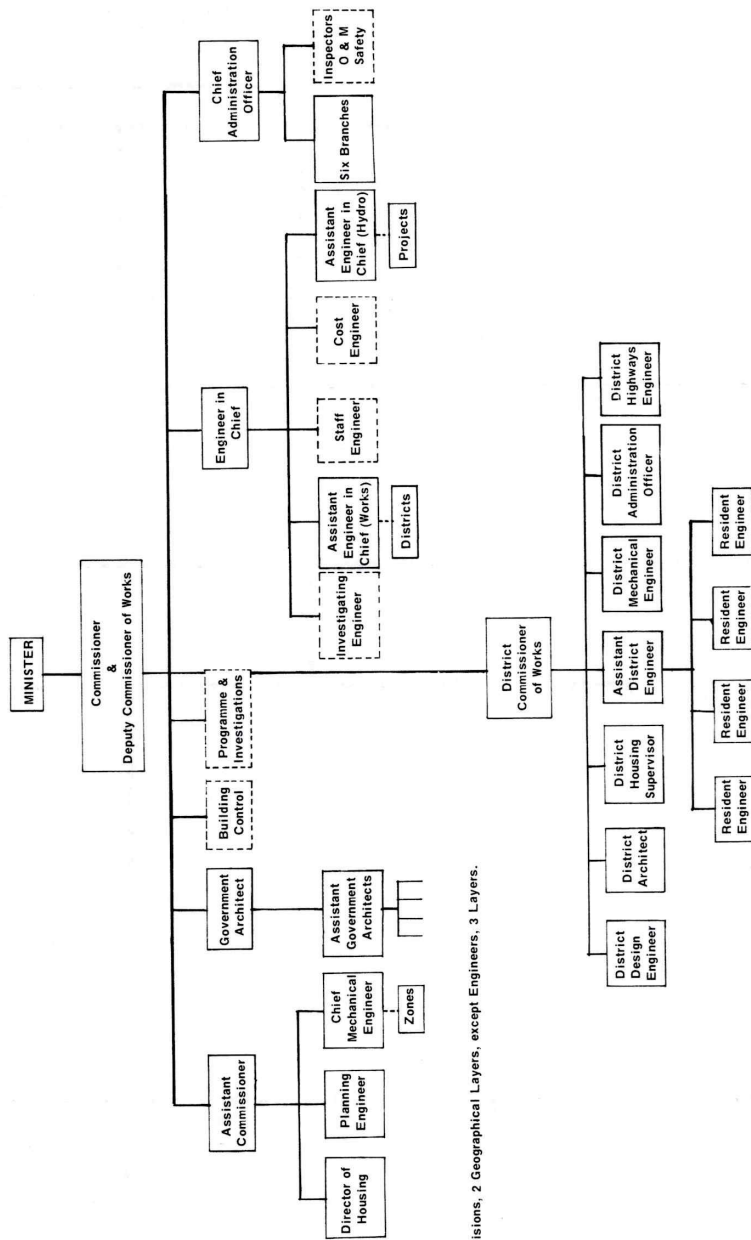
NEW ZEALAND PUBLIC WORKS DEPARTMENT - ORGANISATION 1937



NEW ZEALAND PUBLIC WORKS DEPARTMENT - ORGANISATION 1947

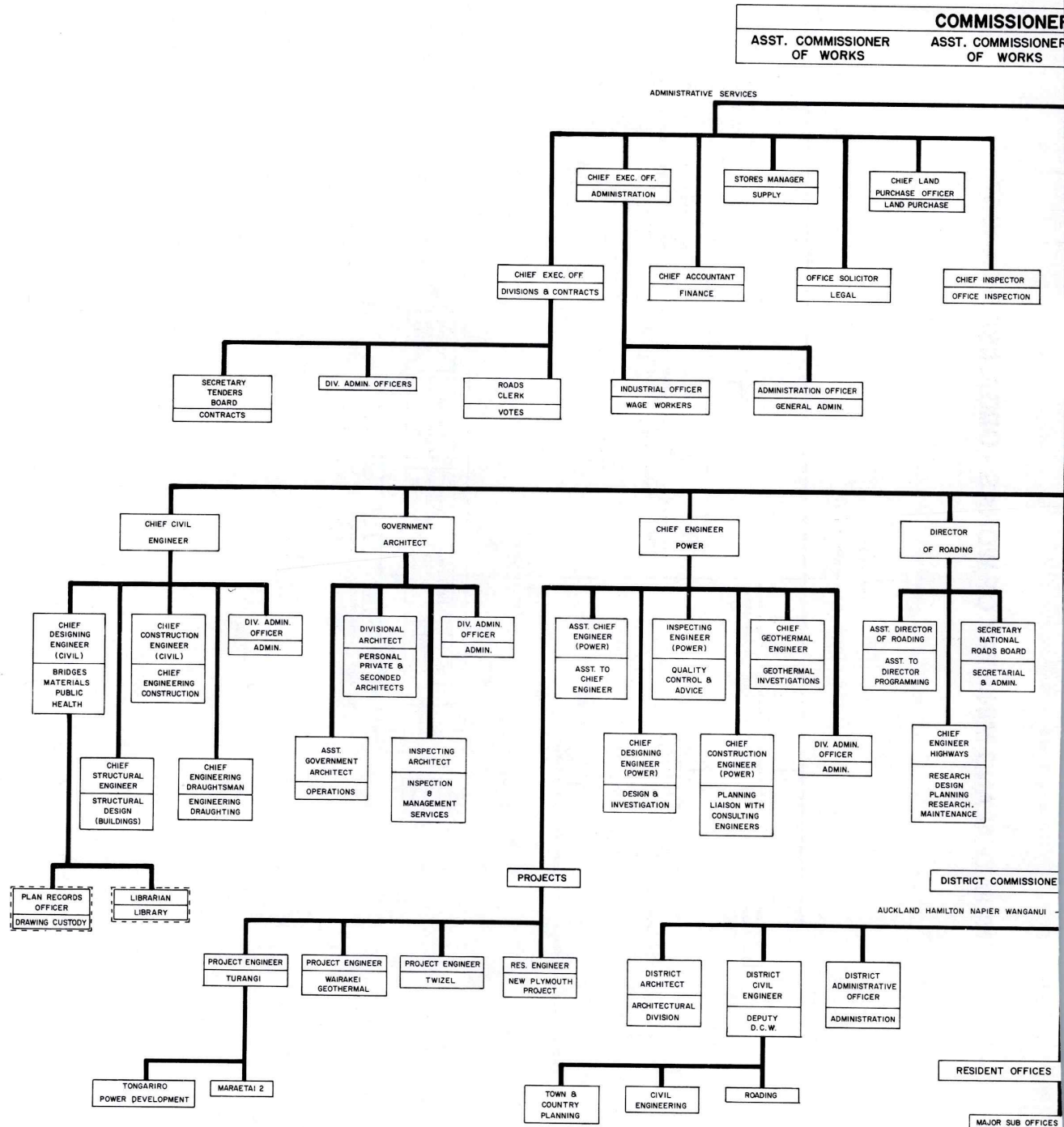


NEW ZEALAND MINISTRY OF WORKS - ORGANISATION 1957



All Divisions, 2 Geographical Layers, except Engineers, 3 Layers.

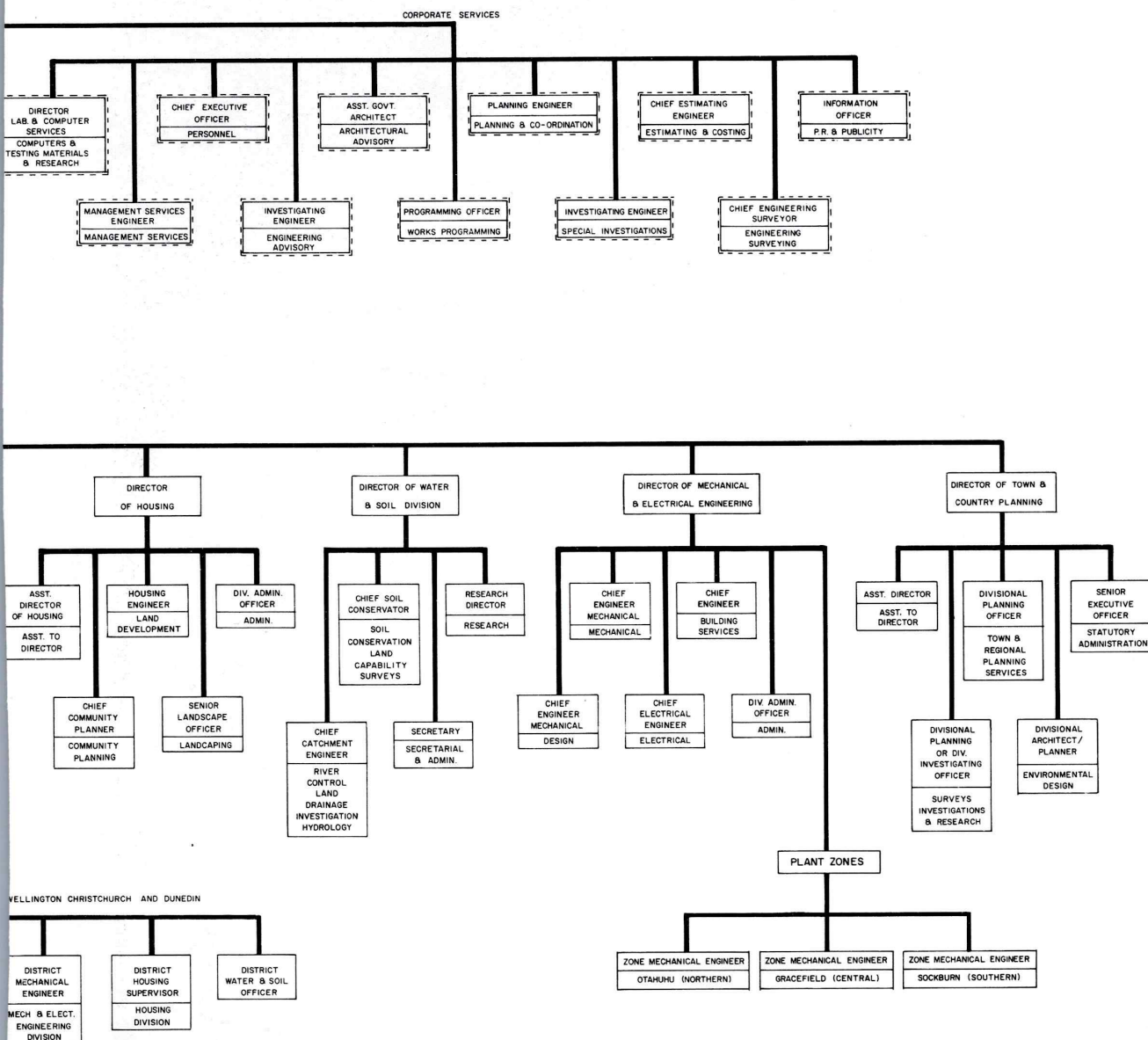
NEW ZEALAND MINISTRY OF WORKS



ORGANISATION CHART 1970

OF WORKS

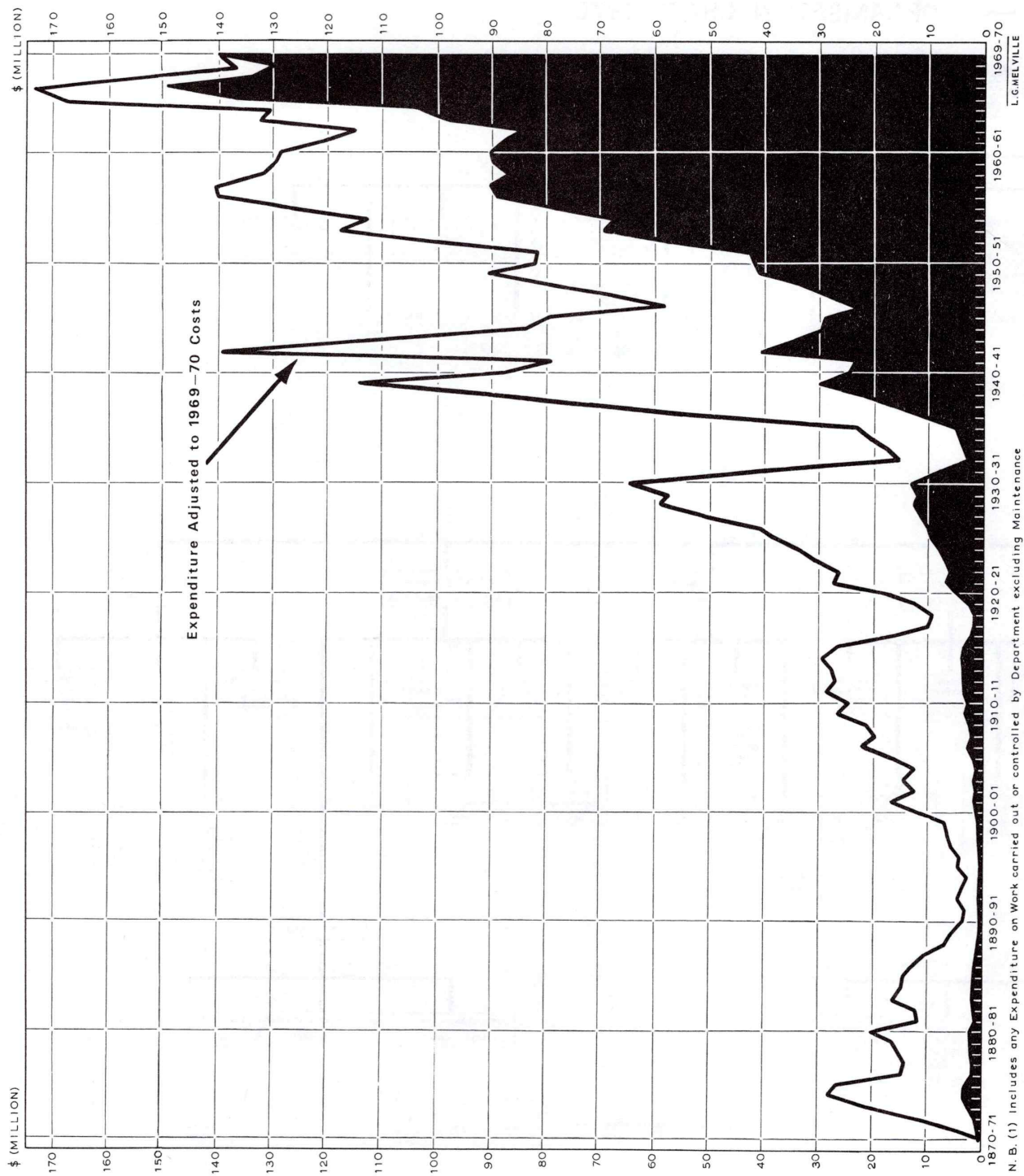
ASST. COMMISSIONER
OF WORKS



SOLID LINES = LINE FUNCTIONS
DOTTED LINES = STAFF FUNCTIONS

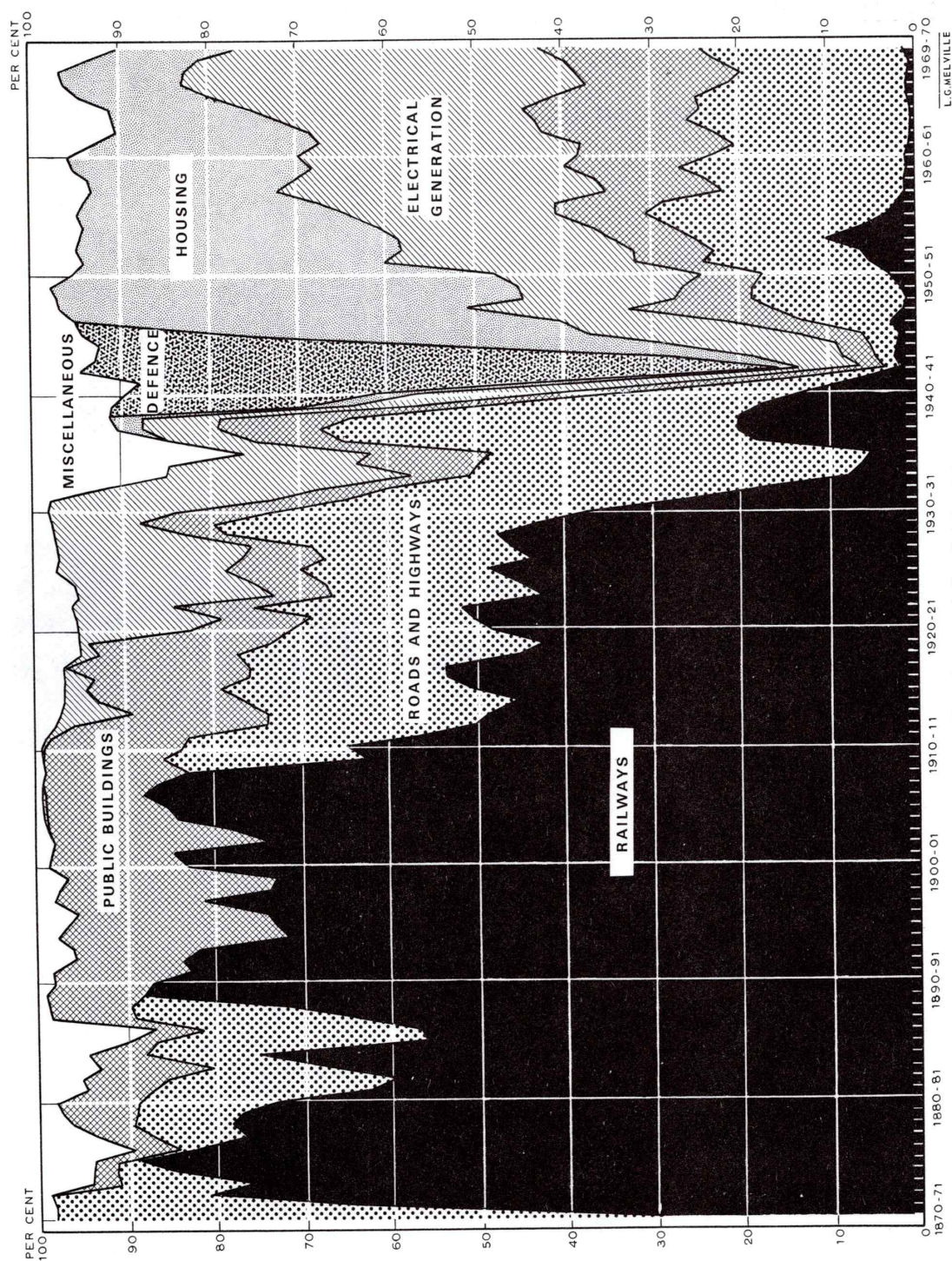
APPENDIX IV *Annual Construction Expenditure*

ANNUAL CONSTRUCTION EXPENDITURE 1870-71 TO 1969-70



ANNUAL CONSTRUCTION EXPENDITURE 1870-71 TO 1969-70

PROPORTIONED BY MAIN ACTIVITIES

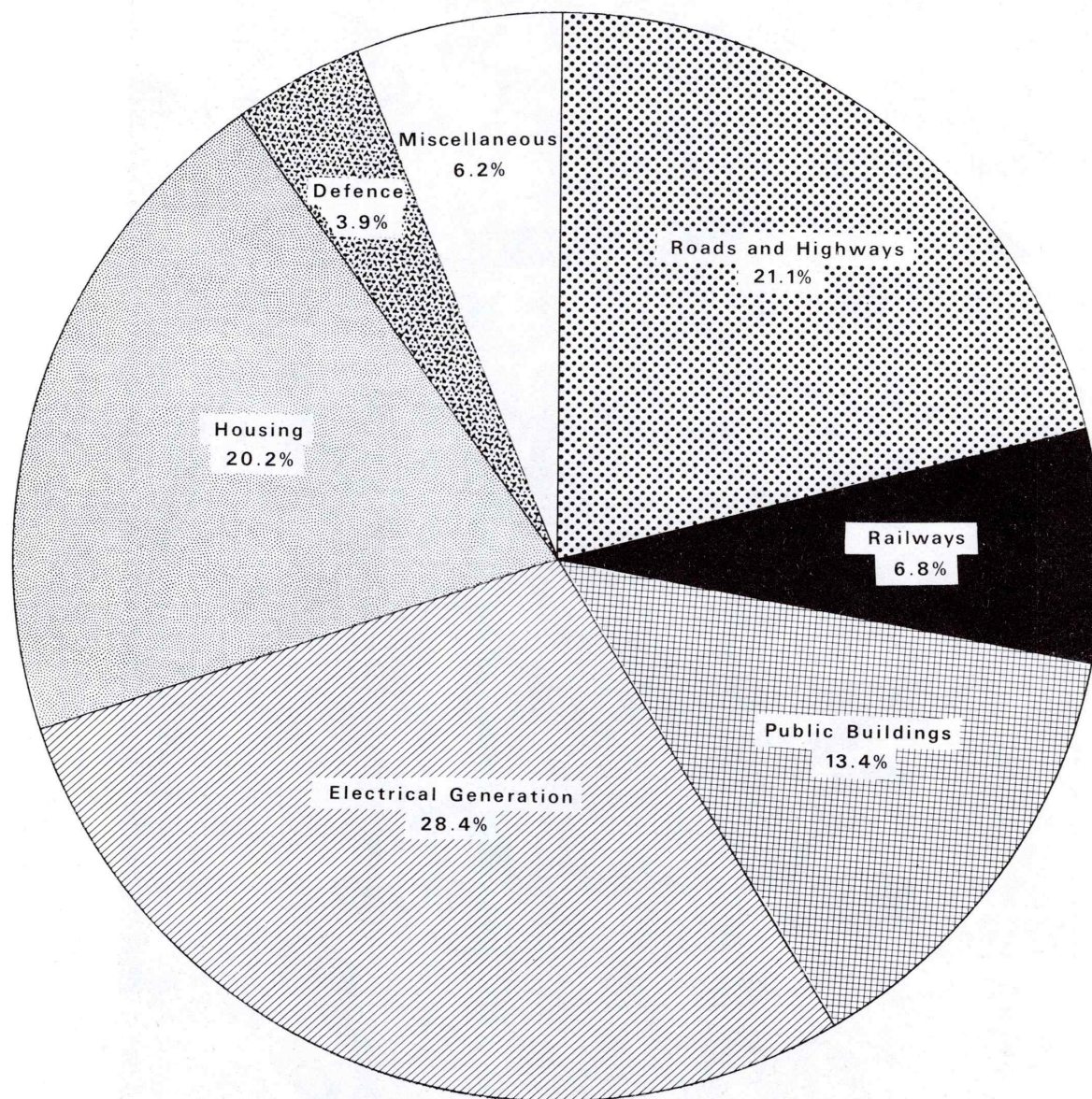


N.B. (1) Includes any Expenditure on Work carried out or controlled by Department excluding Maintenance
(2) From 1889-90 to 1908-09 Roading Expenditure was handled by Lands Department and
Roads Department and is not shown
(3) Defence Expenditure for 1939-46 only

APPENDIX V *Total Construction Expenditure 1870-71 to 1969-70*

PROPORTIONED BY MAIN ACTIVITIES

As Recorded in Annual Statements

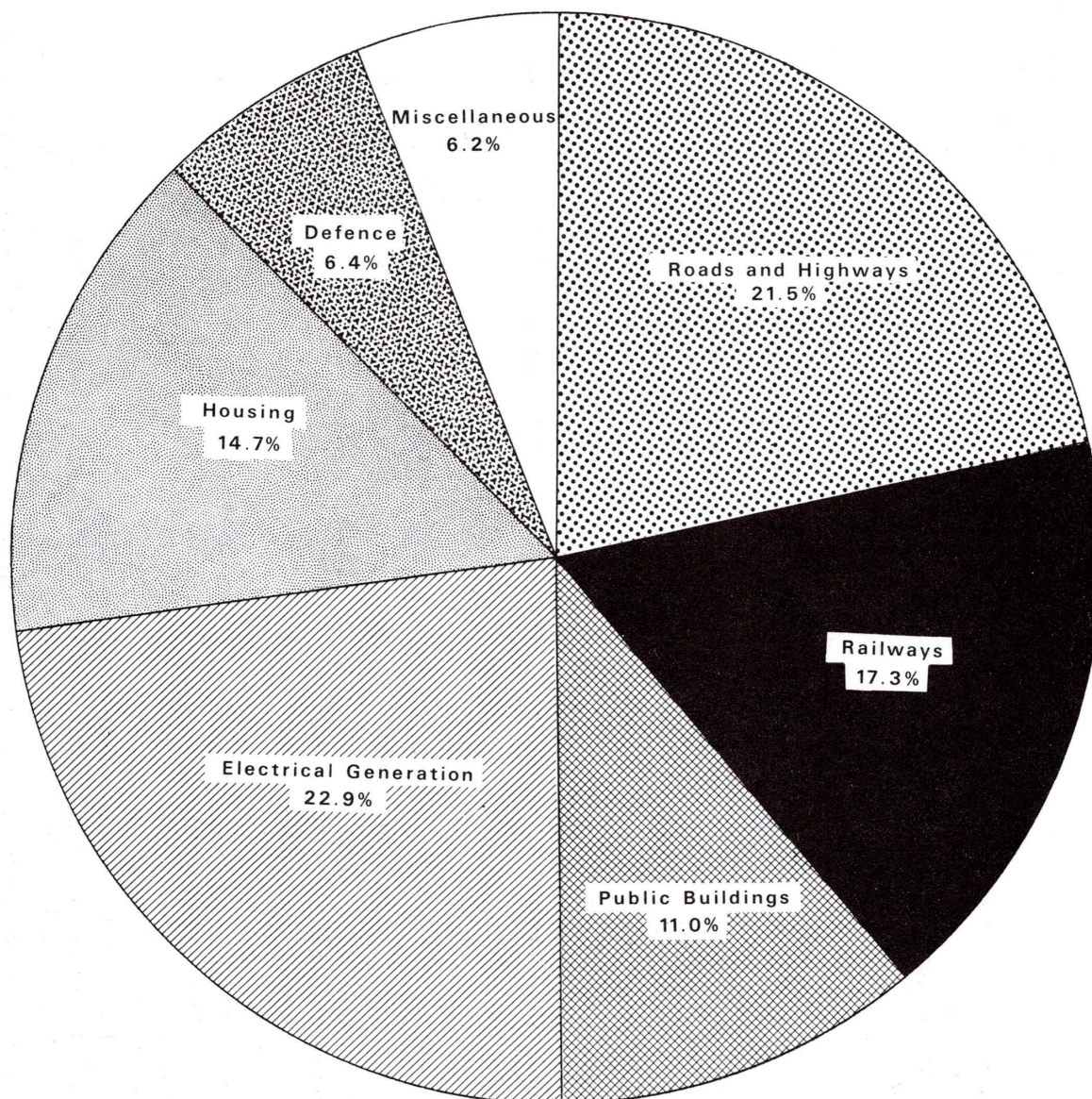


N.B. (1) Includes any Expenditure on Work carried out or controlled by Department excluding Maintenance

(2) Defence Expenditure for 1939-46 only

L.G.MELVILLE

Total Construction Expenditure 1870-71 to 1969-70
PROPORTIONED BY MAIN ACTIVITIES
Adjusted to 1969-70 Costs



N.B. (1) Includes any Expenditure on Work carried out or controlled by Department excluding Maintenance

(2) To give a better comparison of facets of the Department Work, costs have been adjusted in line with more recent costs

(3) Defence Expenditure for 1939-46 only

L.G.MELVILLE

APPENDIX VI *Mileages of Railways Completed in Each Decade by PWD/MOW*

North Island

	1870- 80	1881- 90	1891- 1900	1901- 10	1911- 20	1921- 30	1931- 40	1941- 50	1951- 60	1961- 70	Totals
North Auckland main line	29½	20½	20½	29	55½	39	..	..	..	..	194
Branches ..	3	5	½	..	10	18½	..	19	..	..	56
Auckland-Wellington ..	134	53	4	152½	..	9	9	..	2	6½	370
Branches ..	24½	..	..	..	21	9½	..	..	2	..	57
Frankton-Taneatua ..	1	29½	13	12½	..	97½	..	..	..	2	155½
Branches ..	..	12	51	..	..	..	..	5½	62½	..	131
N. Plymouth - Marton ..	85	50½	..	..	..	..	..	10	..	..	145½
Branches ..	6½	..	..	6	..	23	..	..	..	..	35½
Stratford-Okahakura ..	..	..	..	23	19½	5	42	..	..	..	89½
Beyond Gisborne ..	..	..	..	22	25½	11½	..	..	..	..	59
Gisborne - Palmerston	69½	27	17½	1½	..	39	57½	35	..	2	249
Nth. and 2m. branch											
Woodville-W'gton. and											
4m. branches (Waira-											
rapa) ..	69	22½	27½	..	..	3½	..	3	16	2	143½
North Island totals	422	220	134	246½	131½	255½	108½	72½	82½	12½	1685½

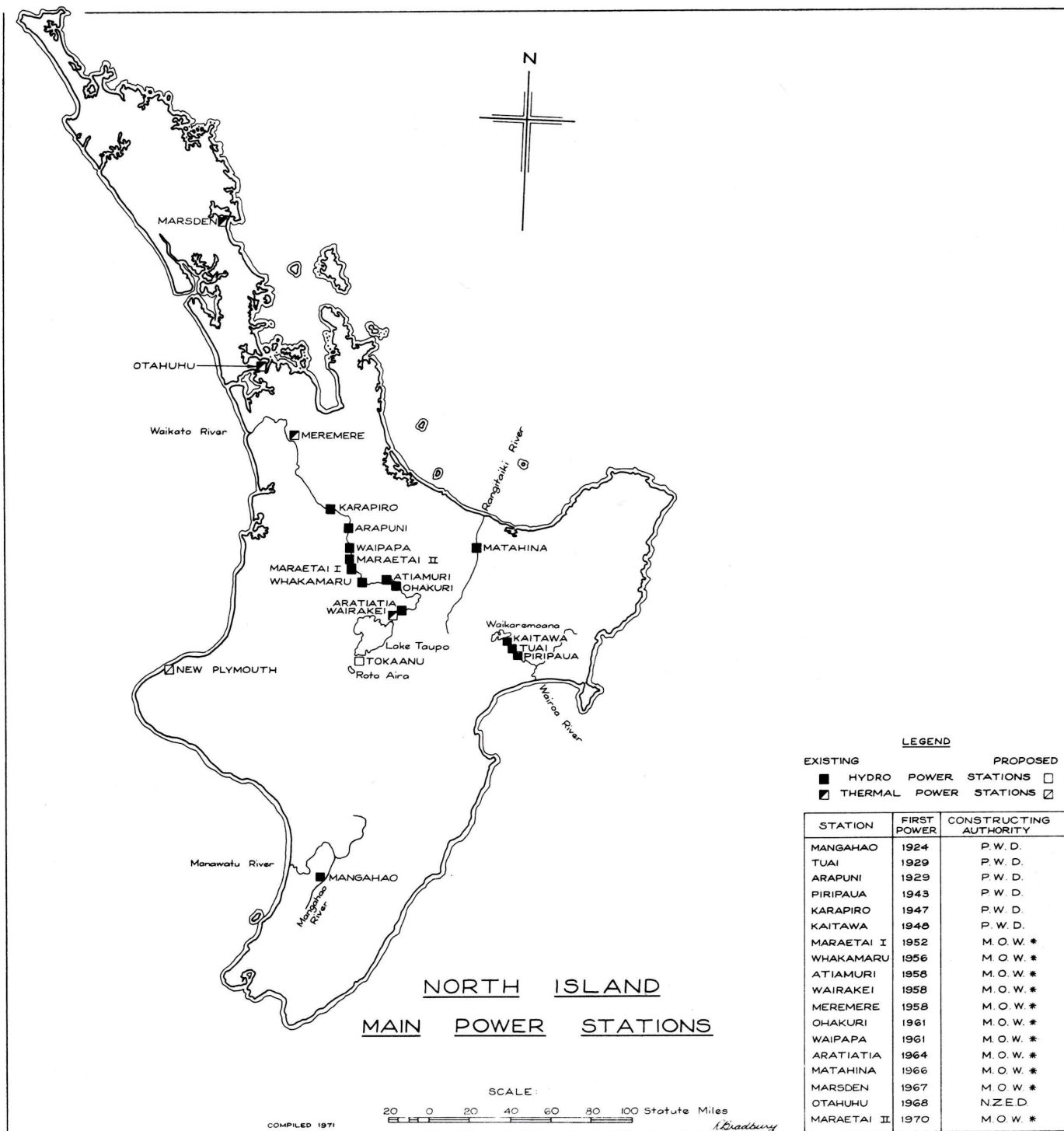
South Island

	1870- 80	1881- 90	1891- 1900	1901- 10	1911- 20	1921- 30	1931- 40	1941- 50	1951- 60	1961- 70	Totals
Picton-Invercargill ..	393	..	2½	48½	31	..	12	65½	..	..	552½
Canterbury branches	120	90	..	..	13	..	..	..	..	..	223
Otago branches ..	118½	96	37½	58½	31½	32	..	..	..	..	374
Nelson section ..	20	3	9½	15½	12½	4	..	..	..	..	64½
West Coast section ..	27	½	31½	29	22	2½	..	21½	..	..	134
Stillwater-Rolleston ..	31	..	16	22	15	8	..	..	..	..	92
Otago Central ..	..	17	68½	49	..	12½	..	..	..	..	147
Kingston-Winton ..	68½	..	..	..	..	..	..	..	..	..	68½
South Island totals	778	206½	165½	222½	125	59	12	87	..	..	1655½
North Island totals	422	220	134	246½	131½	255½	108½	72½	82½	12½	1685½
Grand totals	1200	426½	299½	469	256½	314½	120½	159½	82½	12½	3341

Compiled from "Geographical Mileage Table" issued by New Zealand Railways Department, 1957.
Lines since closed down are included.

Railways constructed by other organisations, e.g., companies and provincial governments, are not included.
Horizontal totals do not necessarily give the distance between terminals.

APPENDIX VII *Locations of Main Power Stations*





LEGEND

EXISTING PROPOSED
 ■ HYDRO POWER STATIONS □

STATION	FIRST POWER	CONSTRUCTING AUTHORITY
WAIPORI	1907	DUNEDIN CITY COUNCIL
COLERIDGE	1914	P. W. D.
MONOWAI	1925	SOUTHLAND POWER BOARD
WAITAKI	1935	P. W. D.
ARNOLD	1936	GREY POWER BOARD
COBB	1944	P. W. D.
HIGHBANK	1945	P. W. D.
TEKAPO	1951	M. O. W. *
ROXBURGH	1956	M. O. W. *
BENMORE	1965	M. O. W. *
AVIEMORE	1969	M. O. W. *
MANAPOURI	1969	M. O. W.

* for N.Z.E.D.

BY DESIGN

APPENDIX VIII *Ministers of Public Works/Works*

William Gisborne ..	Minister of Public Works <i>ad interim</i>	27 September 1870	6 December 1871
John Davies Ormond ..	Minister of Public Works	..	10 September 1872
Donald Reid ..	Minister of Public Works	..	11 October 1872
John Davies Ormond ..	Minister of Public Works	..	29 October 1872
Edward Richardson ..	Minister of Public Works	..	4 January 1877
John Davies Ormond ..	Minister of Public Works	..	13 October 1877
William Jas. Mudie Larnach ..	Minister of Public Works	..	5 March 1878
James Macandrew ..	Minister of Public Works	..	8 October 1879
Richard Oliver ..	Minister of Public Works	..	31 May 1881
John Hall ..	Acting Minister of Public Works	..	21 April 1882
Walter Woods Johnston ..	Minister of Public Works	..	23 November 1883
Edwin Mitchelson ..	Minister of Public Works	..	16 August 1884
Edward Richardson ..	Minister of Public Works	..	28 August 1884
Edwin Mitchelson ..	Minister of Public Works	..	3 September 1884
Edward Richardson ..	Minister of Public Works	..	8 October 1887
Edwin Mitchelson ..	Minister of Public Works	..	17 October 1889
Thomas Fergus ..	Minister of Public Works	..	24 January 1891
Richard John Seddon ..	Minister of Public Works	..	2 March 1896
William Hall-Jones ..	Minister of Public Works	..	30 November 1908
Roderick McKenzie ..	Minister of Public Works	..	28 March 1912
William Donald Stuart ..	Minister of Public Works	..	10 July 1912
Macdonald ..	Minister of Public Works	..	3 April 1920
Sir William Fraser ..	Minister of Public Works	..	12 June 1926
Joseph Gordon Coates ..	Minister of Public Works	..	10 December 1928
Kenneth Stuart Williams ..	Minister of Public Works	..	28 May 1930
Ethelbert Alfred Ransom ..	Minister of Public Works	..	22 September 1931
William Burgoyne Taverner ..	Minister of Public Works	..	10 April 1933
Joseph Gordon Coates ..	Minister of Public Works	..	6 December 1935
John Bitchener ..	Minister of Public Works	..	21 January 1941
Robert Semple ..	Minister of Public Works	..	8 November 1942
Hubert Thomas Armstrong ..	Minister of Public Works	..	16 April 1943
Robert Semple ..	Minister of Works	..	13 December 1949
Robert Semple ..	Minister of Works	..	12 December 1957
William Stanley Goosman ..	Minister of Works	..	12 December 1960
Hugh Watt ..	Minister of Works	..	20 December 1963
William Stanley Goosman ..	Minister of Works	..	8 December 1972
Percy Benjamin Allen ..	Minister of Works	..	..
Hugh Watt ..	Minister of Works	..	..

APPENDIX IX *Permanent Heads of Department Public Works* Ministry of Works*

George Sisson Cooper†	..	Under-Secretary	..	..	5 April 1871
John Knowles	..	Under-Secretary	..	..	31 March 1883
Charles Thomas Benzoni	..	Acting Under-Secretary	..	..	16 November 1883
Charles Yelverton O'Connor	..	Under-Secretary	..	..	30 May 1890
Wm. Newsham Blair	..	Engineer-in-Chief and Under-Secretary	..	..	Died 4 May 1891
Wm. Henry Hales	..	Acting Engineer-in-Chief and Under-Secretary	..	..	7 June 1891
Horotio Jno. H. Blow	..	Acting Under-Secretary	..	..	11 October 1891
Horotio Jno. H. Blow	..	Under-Secretary	..	..	20 July 1916
Wm. Stonham Short	..	Under-Secretary	..	..	12 May 1920
Robt. West Holmes	..	Engineer-in-Chief and Under-Secretary	..	..	31 July 1920
Frederick Wm. Ferkert	..	Engineer-in-Chief and Under-Secretary	..	..	31 October 1932
Charles John McKenzie	..	Engineer-in-Chief and Under-Secretary	..	..	21 July 1936
John Wood	..	Engineer-in-Chief and Under-Secretary	..	..	28 February 1941
Wm. Langston Newnham	..	Engineer-in-Chief and Under-Secretary	..	..	29 September 1943
Wm. Langston Newnham	..	Engineer-in-Chief	..	..	31 March 1946
Edgar Ravenswood McKillop	..	†Commissioner of Works	..	..	31 March 1955
Frederick Melrose Horowhenua Hanson	..	Commissioner of Works	..	..	21 December 1961
John Thomson Gilkison	..	Commissioner of Works	..	..	31 March 1965
Percy Lyndon Laing	..	Commissioner of Works	..	..	12 July 1969
Frank Richardson Askin	..	Commissioner of Works	..	..	31 January 1971
James Henderson Macky	..	Commissioner of Works	..	..	

*The Public Works Department was merged in the Ministry of Works from the end of May 1948.

†Appointed "Under-Secretary for the colony of New Zealand" from 1 June 1870 he filled the office until Knowles arrived.

‡Appointed Commissioner of Works on 1 January 1945.

APPENDIX X *Heads of Engineering Division*

John Blackett	..	Acting Engineer-in-Chief	..	1 October 1870	28 June 1871
John Carruthers	..	Engineer-in-Chief	..	29 June 1871	May 1878
John Blackett	..	Engineer-in-Charge, North Island	..	16 May 1878	March 1884
William Newsham Blair	..	Engineer-in-Charge, Middle Island	..	1 May 1878	March 1884
John Blackett	..	Engineer-in-Chief	..	7 March 1884	31 March 1889
William Newsham Blair	..	Assistant Engineer-in-Chief	..	1 April 1889	30 May 1890
William Newsham Blair	..	Engineer-in-Chief and Under-Secretary	..	31 May 1890	Died 4 May 1891
William Henry Hales	..	Acting Engineer-in-Chief and Under-Secretary	..	20 January 1891	9 June 1891
William Henry Hales	..	Acting Engineer-in-Chief	..	10 June 1891	31 March 1892
William Henry Hales	..	Engineer-in-Chief	..	1 April 1892	31 March 1906
Peter Seton Hay	..	Acting Engineer-in-Chief	..	29 January 1906	31 March 1906
Peter Seton Hay	..	Engineer-in-Chief	..	1 April 1906	19 March 1907
Robert West Holmes	..	Engineer-in-Chief	..	1 April 1907	12 May 1920
Robert West Holmes	..	Engineer-in-Chief and Under-Secretary	..	13 May 1920	31 July 1920
Frederick William Fulkert	..	Engineer-in-Chief and Under-Secretary	..	24 August 1920	31 October 1932
Charles John McKenzie	..	Engineer-in-Chief and Under-Secretary	..	1 November 1932	21 July 1936
John Wood	..	Engineer-in-Chief and Under-Secretary	..	22 July 1936	28 February 1941
William Langston Newnham	..	Engineer-in-Chief and Under-Secretary	..	1 March 1941	29 September 1943
William Langston Newnham	..	Engineer-in-Chief (Permanent Head)	..	30 September 1943	31 March 1946
Thos. George Gordon Beck	..	Acting Engineer-in-Chief	..	1 April 1946	30 June 1946
Fritz Langbein	..	Acting Engineer-in-Chief	..	1 July 1946	15 August 1946
Fritz Langbein	..	Engineer-in-Chief	..	16 August 1946	19 February 1948
Fritz Langbein	..	Assistant Commissioner of Works (Engineering) and Engineer-in-Chief	..	20 February 1948	31 March 1949
Fritz Langbein	..	Engineer-in-Chief	..	1 April 1949	31 May 1951
Charles William Oakey Turner	..	Engineer-in-Chief	..	1 June 1951	10 Dec 1962
Harry Lancelot Hume	..	Chief Civil Engineer	..	11 December 1962	31 March 1966
Bruce William Spooner	..	Chief Civil Engineer	..	1 April 1966	25 July 1971
Alex. Gordon Stirrat	..	Chief Civil Engineer	..	26 July 1971	

APPENDIX XI *Heads of Administrative Division*

George Sisson Cooper	..	Under-Secretary	..	1 October 1870	5 April 1871
John Knowles	..	Under-Secretary	..	6 April 1871	31 March 1883
Charles Thomas Benzoni	..	Acting Under-Secretary	..	1 April 1883	16 November 1883
Charles Yelverton O'Connor	..	Under-Secretary	..	17 November 1883	31 May 1890
Horatio John Hooper Blow	..	Assistant Under-Secretary	..	31 May 1890	7 June 1891
Horatio John Hooper Blow	..	Acting Under-Secretary	..	8 June 1891	11 October 1891
Horatio John Hooper Blow	..	Under-Secretary	..	12 October 1891	20 July 1916
William Stonham Short	..	Under-Secretary	..	20 July 1916	12 May 1920
George Crosbie Godfrey	..	Assistant Under-Secretary	..	13 May 1920	24 October 1923
Charles Evans Bennett	..	Assistant Under-Secretary	..	21 December 1923	13 January 1937
Henry Arthur	..	Assistant Under-Secretary	..	14 January 1937	15 June 1938
Norman Edwin Hutchings	..	Acting Assistant Under-Secretary	..	1 December 1937	15 June 1938
Norman Edwin Hutchings	..	Assistant Under-Secretary	..	16 June 1938	29 September 1943
Norman Edwin Hutchings	..	Under-Secretary	..	30 September 1943	30 May 1948
Stephen Roberts	..	Chief Administrative Officer	..	31 May 1948	16 October 1952
Norman Edwin Hutchings	..	Chief Administrative Officer	..	17 October 1952	14 July 1958
Donald Morgan Grover	..	Chief Administrative Officer	..	15 July 1958	19 December 1962
Donald Morgan Grover	..	Assistant Commissioner of Works	..		
Brian Creagh Magill	..	(Admin.) ..	..	20 December 1962	17 October 1965
	..	Assistant Commissioner of Works	..		
	..	(Admin.) ..	..	18 October 1965	25 March 1971
John Newton Leon Searle	..	Assistant Commissioner of Works	..		
	..	(Admin.) ..	..	12 May 1971	

ARCHITECTURAL DIVISION

William Henry Clayton	..	Colonial Architect	..	6 August 1869	23 August 1877*
Pierre Finch Martineau Burrows	..	Architect	..	24 August 1877	April 1878
Pierre Finch Martineau Burrows	..	Architect for North Island	..	April 1878	31 March 1884
Charles Edward Beatson	..	Draftsman	..	1 April 1884	31 August 1887
Architectural section was with Public Buildings Department which was attached to the Defence Department 1 April 1889 to 30 June 1890.					
John Campbell	..	Draftsman	..	1 October 1892	31 March 1898
John Campbell	..	Architectural Draftsman	..	1 April 1898	
John Campbell	..	Architect	..	1 July 1909	3 October 1922
John Campbell	..	Government Architect	..	17 April 1923	31 October 1941
John Thomas Mair	..	Government Architect	..	1 November 1941	14 February 1942
Robert Adams Patterson	..	Acting Government Architect	..	15 February 1942	19 February 1948
Robert Adams Patterson	..	Government Architect	..		
Robert Adams Patterson	..	Assistant Commissioner of Works (Housing and Buildings) and Government Architect	..	20 February 1948	31 March 1949
Robert Adams Patterson	..	Government Architect	..	1 April 1949	18 May 1952
Francis Gordon Wilson	..	Government Architect	..	19 May 1952	18 February 1959
Fergus George Frederick Sheppard	..	Acting Government Architect	..	19 February 1959	12 May 1959
Fergus George Frederick Sheppard	..	Government Architect	..	13 May 1959	17 December 1971
John Robt. Patrick	..	Government Architect	..	20 December 1971	
Blake-Kelly					

*Clayton's office joined the Public Works Department only in 1873.

HYDRO-ELECTRIC BRANCH

Evan Parry	..	Electrical Engineer	..	July 1911	31 October 1913
Evan Parry	..	Chief Electrical Engineer	..	1 November 1913	31 March 1919
Lawrence Birks	..	Chief Electrical Engineer	..	1 April 1919	Died 25 July 1924
Frederick Templeton	..	Chief Electrical Engineer	..	26 July 1924	31 March 1946†
Mannheim Kissel					

†Became permanent head of the State Hydro-electric Department.

APPENDIX XIII *John Rochfort's Report* on Obstructions to Survey*

"26th June.—I commenced work at Marton, and after about a fortnight, during which it rained almost incessantly, arrived at Ngahurukehu. At Turangarere, where I first met any Natives, they were unwilling to let me pass until a general meeting took place; but, as the opposition was feeble, I went on, and have since had a letter from the same people, requesting me to come again and see the advantages they had to offer for the railway coming there.

On arriving at Kerioi I was stopped by the Natives (said to be twenty armed men, but found afterwards to be only six) occupying part of the Rangataua Block (Government land), who allege that Adamson (employed by me on the work) had sold land on the part of Nika Waiata—the woman who is living with him, and who, by the way, is a great warrior—to the extent of three thousand acres more than belonged to her. Pita te Rahui and others were said to be placed in possession of the Rangataua Block by Major Kemp and his council until satisfaction was had for the lost land; and I was informed that if I went on I should be shot. I soon found out that Adamson's presence only added fuel to the fire, and discharged him. Finding Major Kemp was the head, and that he was at Upokongaro, I went down via Hale's Track, but was somewhat delayed by snow on the road down. I found Major Kemp at Upokongaro. He said the stopping me was done without his authority. This is doubtful; but he at once said, 'I will support you and help you with five hundred men, if necessary, for I consider a railway will be for the good of my people.' I returned to my work armed with letters from Kemp to Pita te Rahui, and also to some of the principal chiefs of Manganui-a-te-Ao. I returned, and met the stopping party at Rangataua. Pita te Rahui and Remona still held out, as owners of the part in dispute. However, I told them I had nothing to do with the land question, my work concerned the railway only, and that they would be lunatics to stop the railway, which would be a benefit to them. After a long *korero* they, obtaining the consent of a daughter of Pita te Rahui's, allowed me to proceed, and eventually came to work for me, cutting the line through their own district. This may by-and-by be a troublesome question, as they are still planting and occupying part of the block, which, according to Mr. Thorpe's survey, is part of the

*Reprinted from *AJHR*, 1884, D. 5, p. 3. For a summary of this report see pp. 54–5.

Government block (Rangataua). These same people are now very anxious for the line to be made, and asked me to get the fact of the Government approval of this line inserted in the Maori newspaper.

From the Mangawhero (Ohakune) my course lay through Waimarino, near the Hahungatahi, and the country was said to be flat, with but some twenty miles of bush to get through, but there was a Native track which led to Ruakaka, a Native village some twelve miles below Hahungatahi, on the Manganui-a-te-Ao. To save swagging I took the horses through this track to Ruakaka, intending to follow up the River Manganui-a-te-Ao to Waimarino, and cut back to Ohakune. On arriving at Ruakaka I was compelled to pitch my camp within the Native village, and found that the Native, Paora Patapu, whom Kemp had promised to send up before me, had not arrived, and the Natives received my letters from Kemp and Woon with suspicion, alleging, after three days' *korero*, that if Kemp desired their concurrence he should have sent word up to them before now: I had arrived among them without any notice, and they should take me back to Kemp. Accordingly I was marched back to Papatupu, some two miles above the confluence of the Manganui-a-te-Ao with the Wanganui, and there found about eighty Natives assembled. I was kept there another two or three days. The principal men present were: Taumata, Te Kuru Kaanga, Te Peehi, Winiata te Kakai, Manurewa, Turehu, Raukawa, Rangihuatau, Te Aurere, Huriwaka, Te Whaiti, Eniko, Kaiatua.

Rangihuatau spoke in a vacillating way, but said he was a Government man; Taumata was decidedly averse to the railway, and also to any Europeans coming on their land, and said if I had been taken on his land he should have cut up all my belongings in small pieces, and made slaves of myself and my party; Te Kuru spoke against any violence, but was decidedly in favour of keeping Europeans away. All spoke, but Winiata and Te Aurere (who were at heart in favour of the railway) were afraid to speak out: and eventually letters were written to Kemp, and Mr. Woon, and myself, saying if I returned a second time I should be turned back, and any Maoris who were with me would be killed, and if I returned a third time I should be killed. Taumata would agree to nothing, and strongly advised keeping us prisoners here; but several others (including Te Aurere, Te Peehi, Te Kuru, Turehu, and Taurere) were more moderate, and said if I could bring letters from Wahanui or Tawhiao they would not obstruct me. Taumata then came over to me and asked if I understood their ultimatum, at the same time observing, 'If you come again, remember you will go to the ground.' Then he asked me what I thought of his letter to Mr. Woon. I replied I had not thought anything about it, but I should take care that a copy of it found its way to the Government, and they could think what they liked about it. After this seven chiefs were appointed to paddle us down to Wanganui. The following men

were fixed on, so that they might have influence to talk to Major Kemp: Winiata te Kakai, Te Kuru Kaanga, Potatau, Te Aurere, Te Peehi, Iko, Patena. Going down the river we called at Pipiriki, Herurarema, Koriniti, Parikino, and Kaiwhaiki, at all of which places the usual speeches were made, and most of the lower-river Natives were in favour of the railway. We were two and a half days coming down. Some of the Native villages on the Wanganui River are thickly peopled; for instance, at Herurarema and Koriniti there are about 130 to 150 at each place. At Herurarema there is a Catholic mission, consisting of the Rev. Fathers Soulas and Marot, two nuns, and a lay sister, Maria Joseph, long known in Napier by the old residents: they very hospitably entertained me. There is a school here with sixty-four scholars, and average attendance fifty-nine. The Natives possess 2,500 sheep, horses, and cattle, besides ploughs, &c. At Ranana, the site of the celebrated fight at Moutoa, there is also a large flock of sheep, and a fine wharepuni, 83 ft. by 37 ft.: this is called Huriwhenua, and is the arena of the labours of Kemp's council.

On arrival at Upokongaro I secured the services of Mr. Woon, and a meeting took place between my captors and Major Kemp, the result of which I forwarded to you on the 22nd September. Te Kuru Kaanga firmly opposed my returning, saying they did not want the railway; and Winiata and Raukawa privately told me to wait, their tongues were tied now, but by-and-by they would speak.

I then returned to Wellington to seek the advice of the Native Minister, and, if possible, get letters from Wahanui and Tawhiao. During my stay in Wellington overtures were made by Kemp through Mr. R. Woon, which resulted in a more amicable understanding with the Government, and a meeting between the Hon. the Native Minister, and Major Kemp: after which the latter renewed his promises of assistance, and advised my attendance at a large Native meeting at Ranana, and provided a canoe and men for my return. The meeting was largely attended, and included four or five chiefs of Manganui-a-te-Ao, who were convinced by Major Kemp of the advantages of railway communication, and agreed to my going on; but it was considered necessary to take a strong force. Accordingly, on the 27th September six canoes accompanied me with the following people: From Ranana—Paora Patapu, Rena (wife), Eruera te Ua, Te Wikirini, Te Nau, H. N. Walker; from Pipiriki—Kaioroto, Maata (wife), Turawhi, Mahirini, Maehe, Kaawa (wife), Te Rua, Te Heuheu, Te Huia, Te Whainga, Ramere (wife), Rehana, Te Hoeroa; from Herurarema—Tohiora, Reri; from Koriniti—Paori Kurimati, Teake; from Kaiwhaiki—Matiaka, Tutaua, Te Rou; from Kukuta—Hikaka, Wikitoria (wife), from Manganui-a-te-Ao—Te Peehi, Peata (wife).

The Wanganui River closes in at about seven miles up, and from thence

to Ranana it is more or less gorgy, enclosed by hills some three or four hundred feet high. It is, however, possible to get a horse up to Koriniti along a sort of track at the foot of the river-cliffs, but no further, except inland; there are a few low flats, but not of any great extent. At Ranana there is a large clearing, perhaps a thousand acres, a good deal of which is in English grass. Between Koriniti and Manganui-a-te-Ao is almost a continuous gorge. Excepting at Ranana, Herurarema, and Pipiriki the cliffs frown above one almost perpendicularly, especially between Pipiriki and Manganui-a-te-Ao, and the river runs stilly; I am told that for a long distance above Manganui-a-te-Ao the river has the same gorgy character. I remarked no leading valleys coming from the east from Upokongaro to Manganui-a-te-Ao, but many of the side-hills have extensive flat terraces on top, and small creeks, and doubtless good roads could be graded out, more especially as the hills (mostly *papa*) are not of any great height.

On arriving at Papatupu we were received by about eighty Natives with anything but a friendly demonstration, Taumata, Te Kuru, and Te Oeo being the most determinedly obstructive. The *korero* lasted several days, and at last ended with the up-river Natives leaving the whare in a body and refusing to say or hear any more, and they next morning left Papatupu and went up the river seven miles to their principal place—Te Papa. On the following day we followed them up, and, on arriving within a couple of miles, sent our messenger (Raukawa) to them. This man, Raukawa, being an up-river Native, was considered a seceder and a spy; so they decided to shoot him then and there. A considerable time, however, elapsed before a man could be found to undertake the deed: at last one volunteered, who seized a gun and went towards the door to effect his purpose; but time enough had elapsed to allow for reflection, and several stopped him. Our messenger returned early next morning and said he had come on our opponents busy making cartridges, but after a night's talk they had agreed to meet us. We accordingly went to Te Papa, found a white flag flying, and some twenty-five Natives armed, who fired over our heads twice; and, after two or three days endeavouring to come to terms, they almost (to use my Native companion's words) forced us back at the muzzle of the gun, and I eventually returned to Wanganui and put myself in communication with the Native Minister and asked for a few troopers. Mr Bryce thought it unwise to force our way, and directed me to go round to the north end of their district and endeavour to secure the friendship of Peehi Turoa; but, on returning to Ranana, I learned that the obstructionists had dispersed and gone to their planting, so I went on with my work and completed to Waimarino without any further stoppage. Here I found Peehi Turoa, although a rank Hauhau, after a little talk, not averse to the railway, and ready to help me. About this time I learned that Major Kemp, who was to have gone to Taumaranui

by canoe before me, had gone down to Wanganui, summoned as a witness in a Court case; so I visited Topia Turoa, Matuahu, and Te Heuheu at their pas at Rotoaira, Tokaano, and Waihi, urging them to send men of influence to help me at Taumaranui. The former contented himself by sending a telegram to Mr Bryce informing him that he would allow me to go on, but the latter sent two men with me. About this time two Maoris arrived from Tuhua saying that there were two powerful *aukatis* to stop my further progress, and, besides, a dozen mounted Hauhaus patrolling and waiting for us, averring that they were sure to be hung for Moffatt's murder and one or two more would not alter the case. This news so alarmed the Taupo Natives that it was with the utmost difficulty at last I got the promised two to go with us, but on getting within a few miles of Taumaranui they refused to go further and returned. I had still some other Natives with me, two of whom were of those who engaged determinedly in the armed opposition at Manganui-a-te-Ao: one of these went before me, and at every slight noise he started back on my toes, fearing the mounted patrol. I may here say the Wanganui River above Taumaranui is open for seven or eight miles, with five Maori settlements; and Watarupurupu, the furthest open land up the river, where I first came out of the bush from Waimarino, is the scene of a celebrated fight between the Patutokotoko (who gave me so much trouble in the Manganui-a-te-Ao) and the Ngati-maniapoto. The old pa of the Patutokotoko is on a flat-topped isolated hill, with open land all round, except towards Piopotea, in which direction the forest stretches to Waimarino. Dotted over the flat below the pa for a mile or more are short posts stuck in the ground; some are rotted and fallen: these mark the spots where the fallen in battle lay or were buried. Turangatahi and Tuhiora were the chiefs of the Patutokotoko, and their descendants speak with pride of having beaten back their border enemies.

To resume: We reached Taumaranui without obstruction, but were received sullenly, without a word of welcome. So, as it was raining, we pitched our tents in the pa, and waited several hours; after which Ngatai and some others arrived and welcomed us, saying he would protect us here, but we could get no further as the country was stopped. After a couple of days, in reply to my letters, about a dozen men of the *aukatis* came down, but after a long talk refused permission to go further or even send a messenger through their country. They said Wahanui had stopped the country for a long time: some of these had been waiting watching the district for the last six months. So I had no choice but to return by Tokaano and go round the west side of Taupo to Kihikihi, some 150 miles. This I did, and saw Rewi and Wahanui, who informed me that Mr. Bryce was coming in a week's time, and that I must wait till then, when it would be settled satisfactorily. This I did, and in the meantime Wahanui sent and brought all the men who had stopped me

out to Kihikihi, including the principal in Moffatt's murder. The meeting which took place was satisfactory in its result, and I have since completed the exploration; and the last words of Rewi (Manga) were, 'Tell Mr. Bryce to hasten on the railway: I am an old man now, and I should like to ride in the railway before I die.'"

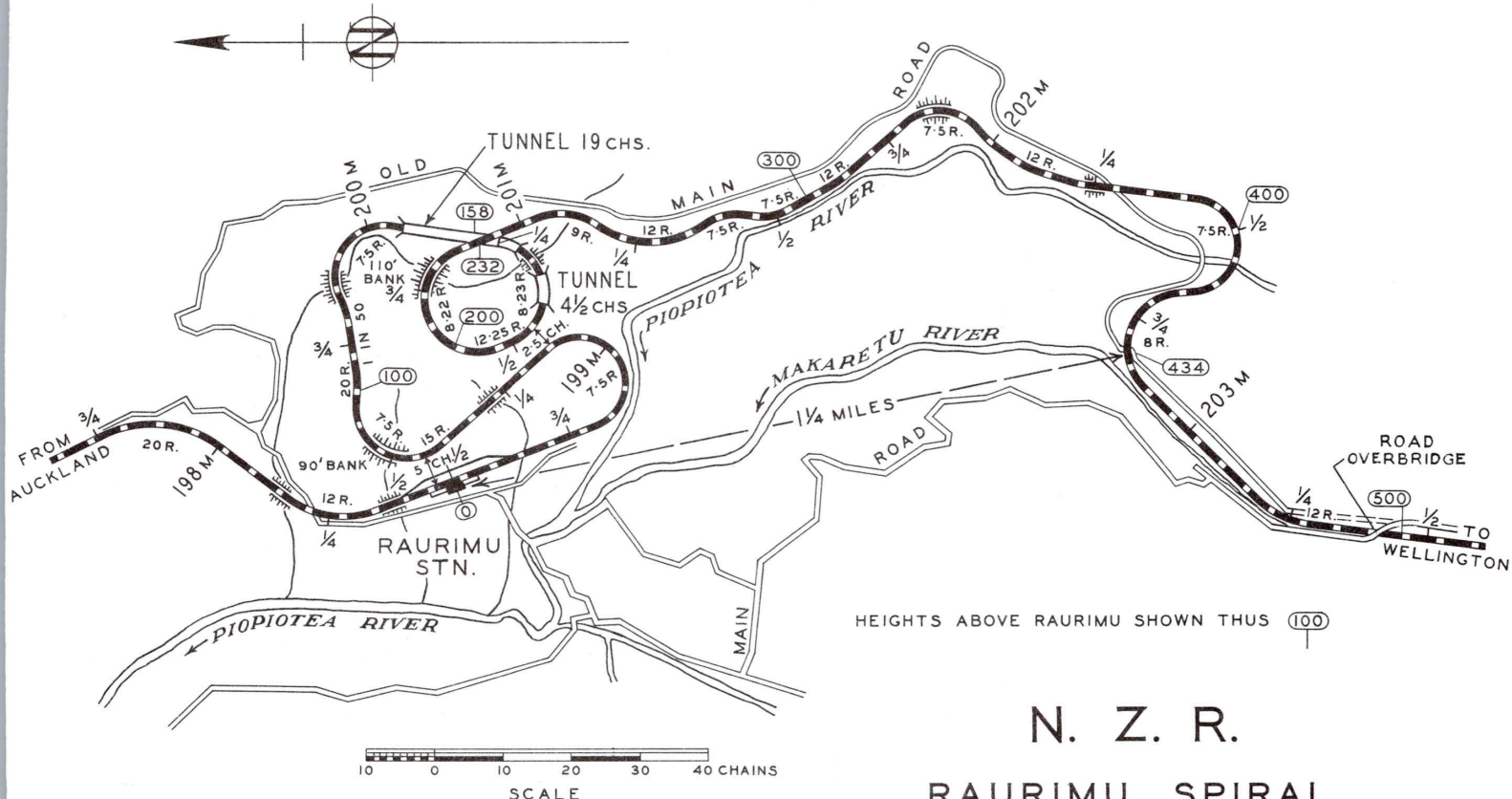
APPENDIX XIV *The Raurimu Spiral*

J. H. Christie, M.I.C.E., F.N.Z.I.E.

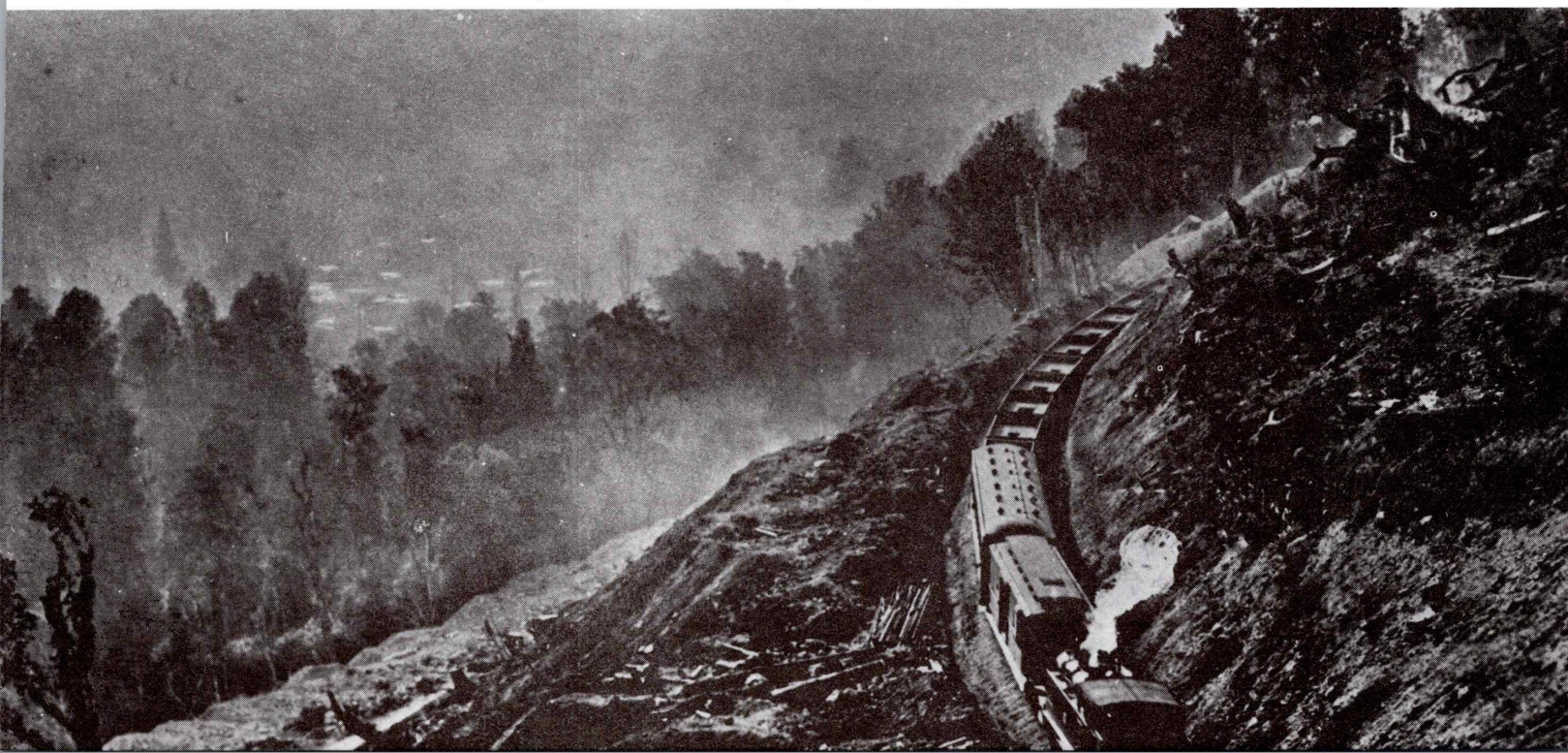
The railway between National Park station and Raurimu is an outstanding piece of skilful location. Between these places the country falls fairly steeply for some 714 ft from the Waimarino plateau to easier ground at the head of the Piopiotea valley. The problem faced by the engineers was to find a route within the limits of grade and curvature laid down which would descend this amount and still keep construction costs within a reasonable figure.

The limiting grade was to be one in fifty, that is not steeper than a rise of one unit in a horizontal distance of fifty of the same units, or put another way, to descend 714 ft would require a horizontal distance of 714×50 , i.e., 35,700 ft or $6\frac{3}{4}$ miles. The distance between the upper and lower ends of the gradient on a direct line is $3\frac{1}{2}$ miles so to flatten to the required grade requires an additional $3\frac{1}{4}$ miles.

Leaving National Park station the line runs down east of and alongside the head of the Makaretu River for $2\frac{3}{4}$ miles, dropping 270 ft. Now the land starts to fall more steeply and if the grade was continued straight ahead it would run off into thin air. Fortunately the country allows the line to swing right and then left across the Piopiotea River and on to the sidling on the far side. This manoeuvre brings it to a point where it has dropped another 77 ft but in a direct line is no nearer to Raurimu. Negotiating several bluffs on the way, the sidling is followed for another mile to where the line is less than half a mile from the foot of the grade but still 264 ft above it. To increase the distance to the $2\frac{1}{2}$ miles necessary to descend this amount the line now has to writhe about like a snake and twist itself into a loop. But even these writhings are controlled because curves must not be sharper than $7\frac{1}{2}$ chains radius, and formation levels must remain as near as possible to the original ground levels. The line now enters the watershed of and makes the first crossing of Arline Creek, which it is to cross no fewer than five times before it is finally on its way to Auckland. After this first crossing it passes above a tunnel and then swings left over the second crossing on a filling 110 ft high. It is now on a near circle of about $8\frac{1}{4}$ chains radius which takes it through a short tunnel, and then over the third crossing of Arline Creek to enter a second tunnel 19 chains long. Some 7 chains inside this trains pass 74 ft beneath the line above. Leaving this tunnel the line again swings left to the fourth crossing of Arline Creek. Fifteen chains on there is another left hand curve, near the end of which the line is only 5 chains from and



A train descending the spiral is about to enter the short tunnel. Later it will travel along the bench on the left and afterwards reach Raurimu seen in the background. *Beattie & Co. N.Z. Railways Publicity.*



80 ft above Raurimu station, but trains still have to travel a mile before reaching it, doing a complete about turn in the process. After entering the long tunnel the layout of the line is similar to a switchback, but with curves connecting the four straights instead of switches.

The story of this piece of railway is not without interest. In 1883–84 when John Rochfort made his preliminary survey (see Appendix XIII) he carried his traverse and line of levels down the old main track, near the State highway. The politicians were pressing for information and he had to leave thorny questions for later investigation. In 1887 other surveyors, Brown, Beere, and Turner, working under his direction ran trial surveys on grades of 1 in 70 and 1 in 50 along the neighbouring Piopiotea and Mangapari valleys and down the Whakapapa valley further east. These surveys indicated that the descent into the Piopiotea was feasible but heavy construction and several major viaducts would be involved.

The report of the Engineer-in-Chief for the year ending 30 June 1898 records that final location had been extended to 103 miles 20 chains from Marton. He commented briefly: "A better line has been obtained down the Piopiotea River valley than was expected to be got." The resident engineer in charge of the survey from December 1895 to August 1899 was R. W. Holmes and there is no doubt that he was responsible for this brilliant piece of location.

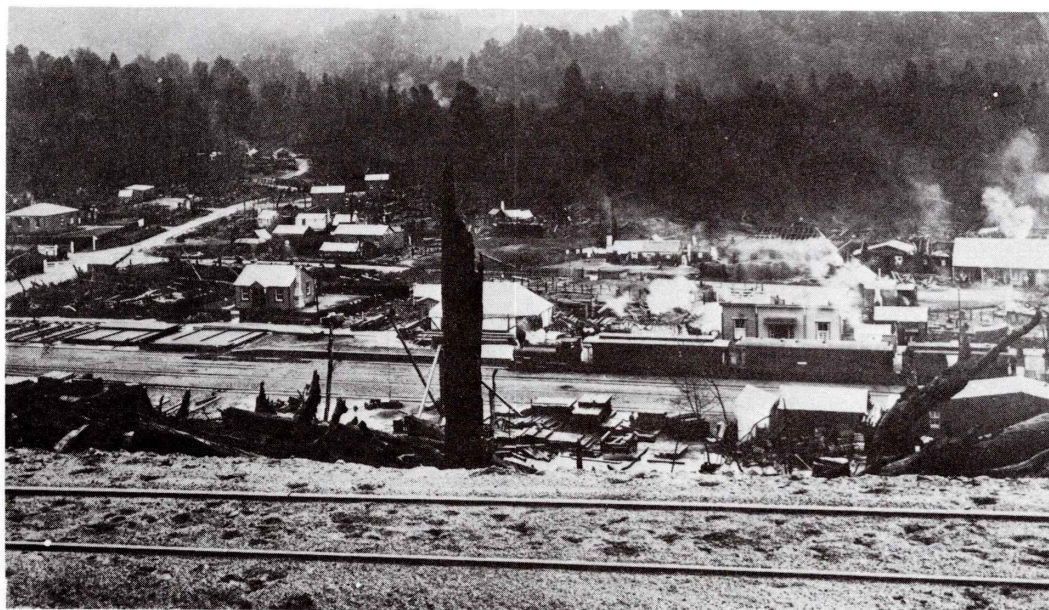
In the mid 1920s when the writer was engaged on surveys for the Wairoa Gisborne railway he had as a chainman a middle aged man named Frank Dale who had worked on the main trunk surveys. He told the story of how one afternoon they had run a compass traverse round near the river south of Raurimu. After studying his papers for a while Mr Holmes looked up and made the dramatic announcement: "Frank, I think we've done it!"

Apart from this story and staff register entries, until recently the author had been able to find no positive evidence as to who conceived this piece of location, which it is obvious from these notes covers much more than the loop itself. Then he came across a photograph of the illuminated address which was presented to Holmes on his retirement in 1920 from the position of engineer-in-chief and under-secretary of the department. As well as having a diagram of the spiral this contains the words: "Such a work as the Spiral at Raurimu, on the North Island Main Trunk Railway, (to mention only one of hundreds) will ever remain a monument to your engineering genius." An important record and a fitting tribute to a great engineer.



Two trains descending the spiral. By the railway the engine in the background is $1\frac{3}{4}$ miles from Raurimu: that in the foreground is just under $2\frac{1}{2}$ miles. It is about 300 ft distant from and 70 ft above the other engine. *Ministry of Works, courtesy Turnbull Library.*

The village of Raurimu in 1908. The railway line in the foreground is only $5\frac{1}{2}$ chains from the station and 80 ft above it but from Raurimu trains have to travel a mile to reach our viewpoint. *Ministry of Works, courtesy Turnbull Library.*



APPENDIX XV *Public Works and Construction Workers Agreement 1921*

INTERIM RATES OF PAY.

					Per hour.
					s. d.
Chuckman	..	..	..	..	2 1½
Concrete work—tunnel	..	..	..	..	2 1½
Concrete work—ordinary	..	..	..	..	2 0
Compressor—Head attendant	..	..	..	..	2 3
Compressor—Attendant	..	..	..	..	2 1½
					Per week.
					£ s. d.
Drivers—horse, one	..	..	..	..	4 10 0
Drivers—horse, two	..	..	..	..	4 15 0
Each additional horse 3/6 per week.					
					Per hour.
					s. d.
Fencer	..	..	..	..	2 0
Foreman—tunnel	..	..	..	2	3 to 2 6
Foreman—concrete	..	..	..	..	2 1½
Ganger—navvy	..	..	..	..	2 0
Ganger—platelayer, tunnel	..	..	..	..	2 3
Ganger—platelayer	..	..	..	..	2 1½
Ganger—quarry	..	..	..	..	2 1½
Ganger—scoop	..	..	..	..	2 1½
Labourer	..	..	..	..	1 10½
Labourer—skilled	..	..	..	..	2 0
Lifters—line	..	..	..	..	1 11¼
Machinemen—tunnel	..	..	..	..	2 3
Machinemen—quarry	..	..	..	..	2 3
Platelayer	..	..	..	..	2 0
Powerhouse attendants	..	..	..	..	2 1½
Quarryman	..	..	..	..	2 0
Rockman	..	..	..	..	2 0
Shift Boss—tunnel	..	..	..	..	2 3
Shoveller—tunnel	..	..	..	..	2 0
Timberman and skilled tunneller	..	..	..	..	2 1½
Truckers	..	..	..	1	11¼ to 2 1½
Waggoner	..	..	..	..	2 1
					Per day.
					s. d.
Timekeeper	..	..	..	..	16 0

WET PLACES.

In all "wet places" six hours' work shall be considered a working day, and shall be paid for as if eight hours had been worked. The question of "wet places" to be agreed upon by Check Inspector and Engineer.

OVERTIME.

Except in "wet places," overtime at rate and one-half will be paid after 8½ hours have been worked on any one day, excepting Saturday, when overtime shall be paid after 4½ hours have been worked.

All time worked in "wet places" after six hours in any one day shall be paid for at rate and one-half, but no overtime work in "wet places" shall be permitted except in cases of extreme urgency.

TRAVELLING TIME

Travelling time, to be paid both ways, for men compelled to live more than one mile from the works, the basis where men walk to be 20 minutes to the mile. Where men, at their option, live further from the works than one mile, they are to be excluded from the preceding clause. Where men are conveyed to the work from depots by train, they shall be paid for travelling time at the daily rate.

Fettlers travelling by velocipede to be paid for travelling time beyond that required to travel the first mile on a basis of 7½ minutes to the mile.

SHIFTING TIME.

A reasonable allowance of time occupied in erecting tents or shifting camp shall be made and paid for at current rates. The Check Inspector and Engineer to interpret "a reasonable allowance of time."

PROVISION OF TOOLS.

Shovels, picks, and axes required in the actual carrying out of the work shall be provided free: but their value shall be held by the Department until they are returned to the storekeeper.

SLIPS AND WASH-AWAYS.

In cases of emergency, where men are required to work long hours under adverse conditions, reasonable refreshments such as tea or coffee, and food, shall be provided at the expense of the Government.

CO-OPERATIVE WORK.

Present co-operative system to continue.

CO-OPERATIVE CONTRACTS.

The Resident Engineer or other responsible Government officer letting a co-operative contract shall prepare a plan and specification for such co-operative contract showing accurately the quantities of work contained in such contract, and shall fix a price to such quantities of work as will permit a fair average workman to earn a daily wage equal to the current rate of wages in the district in which the work is located.

When a co-operative contract is let, the Resident Engineer, or other Government officer letting same, shall supply the co-operative contractor with a copy of the plans and specifications relating to the contract, and also a schedule of quantities and prices, signed by him, and shall also keep a copy of the contract plans, specifications, and schedule, signed by the co-operative contractor.

After a co-operative contract is signed, the quantities shall not be altered or varied unless the scope of the work is definitely reduced or increased; but if the scheduled prices in the contract are found to be too high or too low, the Engineer or other officer in charge of the work may, after giving the co-operative contractors six clear days' notice in writing, reduce or increase such prices and fix them at such rate as will permit a fair average workman to earn a daily wage equal to the current rate of wages ruling in the district where the work is located, or the engineer or other officer in charge may, in his discretion, after giving the co-operative contractors six clear days' notice, terminate the contract.

When the nature of the material encountered varies, the rate at which the new material is to be shifted shall be fixed at the earliest date possible, and the amended price shall cover all such material shifted whether before the fixing of the new price or subsequently.

Earthwork co-operative contracts for cuttings or embankments entailing long leads shall have the prices arranged on a graduated scale, according to the length of the lead, in order to safeguard against the contract being abandoned as the lead lengthens.

PAYMENTS.

In cases of necessity, workmen may be allowed to draw 75 per cent. of wages due, such payment to be made on a day to be nominated by the Department, but not before the expiration of the first fortnight, the Department only retaining money due between the time of measuring up and the actual pay day, same not to exceed six days' wages.

BY DESIGN

HOLIDAYS.

Retrospective from November 20, 1919.

From the above date workmen with over two months' continuous service, but under two years' continuous service, are entitled to the following holidays:—New Year's Day, Boxing Day, Good Friday, Easter Monday, Birthday of the Reigning Sovereign, Labour Day, and Christmas Day.

After two years' continuous service from 20th November, 1919, or any subsequent date, 14 days' annual leave plus two additional holidays will be allowed, viz., Dominion Day and Provincial Anniversary of Province. The before-mentioned holidays, with the exception of Christmas and New Year's Day, may be accumulated and taken with the consent of the Engineer at the end of each year: Provided the workman informs the Engineer three days before the holiday of his intention to work on that day. Overtime shall not be allowed for any of the holidays on which an employee elects to work. Annual leave not to accumulate, and if not taken annually will be forfeited. Seven days' continuous absence from work, without leave, constitutes a break in service.

HORSE HIRE.

The maximum rates for horse hire shall be as follows:—

- 8/- per day when oaten chaff at £8 per ton.
- 8/6 per day when oaten chaff at £9 per ton.
- 9/- per day when oaten chaff at £10 per ton.
- 9/6 per day when oaten chaff at £11 per ton.
- 10/- per day when oaten chaff at £12 per ton.
- 10/6 per day when oaten chaff at £13 per ton.
- 11/- per day when oaten chaff at £14 per ton.
- 11/6 per day when oaten chaff at £15 per ton.
- 12/- per day when oaten chaff at £16 per ton.

Tip horse 1/- per day less than scale.

The suitability of horses for the work to be decided by the Union and the Engineer.

UNDERGROUND VENTILATION.

Ventilation to be subject to the requirements of the Mines Act as applicable to quartz and alluvial mining.

FIREWOOD AND FUEL.

Department to provide fuel at cost price.

HUT ACCOMMODATION.

Single men to be provided with 10ft. × 8ft. hut, suitable bunk and fireplace; married men without family to have hut with room 24ft. × 10ft., plus a room 10ft. × 9ft. for use as kitchen. Married men with a family up to four children to have two rooms 24ft. × 10ft.; for every additional two children, one 10ft. × 8ft. hut to be added.

Bathing facilities, wash-house and cooking range, also fireplace in living room to be provided. Mattress to be provided, the Union to be responsible for prevention of abuse of mattresses.

TENTS MAY BE USED TEMPORARILY.

The use of tents will be restricted as much as possible on railway construction works, and where used shall be framed, and floored, and supplied with a limited amount of timber sidewalls, and provided with fireplace and chimney attached.

RECREATION HALLS.

That where twenty or more men are to be employed on a job for twelve months or more, a recreation hall shall be erected and furnished with tables and chairs. The hall to be placed under the control of the Union.

BATHS AND DRYING ROOMS.

On tunnel works, bathing conveniences with hot and cold water, as well as a drying room, shall be established, as already provided at Huarau, Waikiekie, and Otira.

SANITATION.

That earth closets, with doors and seats and urinal attached, be provided, one for every six hutments; closets and urinals to be regularly disinfected, and when required, shall be removed by the Government.

CLEANSING AND DISINFECTING.

Upon hutments becoming vacant, they shall be cleansed and disinfected before again being rehoused, at the cost of the Government; but if the hut is left in an unreasonably dirty or damaged condition, the cost of renovations will be charged against the employee who vacated. If a man allocated to a hut considers the same not in proper order, he shall call the Overseer's attention thereto, and the question of his absence of liability to make good any damage shall be settled in advance.

GOVERNMENT CANTEENS.

Department will establish canteens for the supply of provisions, etc., on such works as the Minister shall determine.

GRIEVANCES.

Local Engineers shall have power to settle all reasonable grievances on the job with the accredited representative of the men concerned, but if such Engineer is of opinion that the dispute is beyond his authority, he and the Union representative shall each forward a statement to the local District Engineer for settlement. When all efforts of the District Engineer to effect a settlement have failed, then only shall the dispute be referred to Head Office.

Complaints direct from local representatives of the Union re disputes will not be recognised by the Minister or Head Office in future.

DURATION.

This agreement shall remain in operation until the thirtieth day of June, 1922, unless during the ensuing twelve months the Government finds it necessary to review the whole question of the payments to employees in the Public Service, of which the Union will have due notice.

NOTICE.

This agreement, which slightly revises the original agreement between the Public Works Department and the New Zealand Workers' Union, has been submitted to the Minister of Public Works and confirmed by him.

Wellington, July 26, 1921.

Maoriland Worker, Print.



Index NOMINAL*

- Acheson, A. R.: author, f.n. 163.
Adamson: employee of Rochfort, 306.
Alexander, G.: author, reference 118 (p. 202).
Allen, P. B.: role of Department, 211, 257; labour, f.n. 217; logging, 233; Tongariro scheme, 249; listed, 301.
Andersons, Ltd.: contractors Makatote viaduct, 79-80.
Annand, B. C.: reported defects, 194.
Armstrong, H. T.: union organiser, 77; Minister of Public Works, 164; portrait (*illus.*), 164. listed, 301.
Armstrong, Whitworth & Co. Ltd.: railway contract, Arapuni contract, 117.
Arthur, H.: listed, 304.
Askin, F. R.: listed, 302.
Associated Chambers of Commerce: changes wanted, 121; queries, 122.
Atkinson, H. A.: retrenchment policy, 46; threat to abolish department, 51.
Aubert, Sister Maria Joseph: lay missionary, 308.
Auckland Chamber of Commerce: shipping contract, f.n. 22.

Bailey, D.: hero in cylinder incident, 133.
Baker, J. V. T.: quote from *War Economy*, 166.
Basire, F. C.: assistant director of housing, 221.
Beatson, C. E.: listed, 305.
Bechtel Pacific Corporation; consultants, Manapouri scheme, 250.
Beck, T. G. G.: on irrigation, South Canterbury, 148; tractors to tanks conversion, 172-3; machine-gun posts, 174; career, 199; biography, 285; listed, 303.
Beere, G. B.: surveys, 314.
Bell, A. W. D.: report on public buildings, 93.
Bennett, C. E.: listed, 304.
Benzoni, Charles T.: acting under-secretary, 42; services terminated, 43; biography, 280; listed, 302, 304.
Birks, L.: in charge hydro section, 115; listed, 305.
Bish, H. W.: conversion tractors to tanks, 172.
Bitchener, John: listed, 301.
Blackett, John: early career, 10-11; portrait (*illus.*), 10; travels 1870-71, 14; overwork, 23; mainly responsible roads, 39; engineer-in-charge, North Island, 41; Provincial Engineer, Nelson, f.n. 41; engineer-in-chief, 43; relations with O'Connor, 43; consulting engineer to Government, 43; railway route near Patea, 47; Thames valley railway, 48; consulting engineer London, 52; listed, 303.
Blair, Wm. N.: portrait (*illus.*), 40; engineer-in-charge, South Island, 41; assistant engineer-in-chief, relations with O'Connor, 43; engineer-in-chief and under-secretary, 44; death, 44; died, 66; listed, 302, 303.
Blake-Kelly, J. R. P.: listed, 305.
Bloomfield, G. T.: quotation, 1.
Blow, H. J. H.: assistant under-secretary, 43; under-secretary, 66-7; portrait (*illus.*), 67; retired, 68; attack on contractors, 71; biography, 281; listed, 302, 304.
Boyes, J. H.: Public Service Commissioner, conducted inquiry, 195.
Bray, W.: early career, 10.
Brayshaw, C. N.: author, reference 123 (p. 260).
Brogden & Sons: contracts awarded, 19 criticism, f.n. 19; immigrant labour, f.n. 24; possible court action, f.n. 41.
Brooke, W.: tunneller, on inquiry commission, 195.
Brown, C. B.: surveyor, 314.
Brown, J. Evans: chairman of committee, 37.
Bryce: *see* Native Minister.
Buchanan, W. C.: criticism of department, 65.
Burdon, R. M.: quote, 36.
Burrows, P. F. M.: architect, 50; portrait (*illus.*), 50; biography, 283; listed, 305.
Campbell, H. A.: union organiser, 77.
Campbell, John: in charge architects, 93; won competition Parliament Buildings, other buildings, 95; listed, 305.
Carkeek, Morgan: N.I.M.T.R. investigations, 54.
Carrie, I. M.: research essay, 256.
Carrington, C. J.: attack on department, 125.
Carruthers, John: first engineer-in-chief, early career, 11; portrait (*illus.*), 11; attacks on, 20; socialist leanings, 20; overwork, 23; need for immigration, 24; circular re returns, f.n. 31; mainly responsible railways, 39; office abolished; offered Engineer-in-charge North Island, 40-1; consulting engineer to Government, 41; report on N.I.M.T., 52; listed, 303.
Chapman, R. M.: source, reference 29 (p. 119).
Christie, J. H.: re sluicing, f.n. 22; surveys for N.I.M.T., f.n. 52; re-institution university training, f.n. 97; examination staff records, reference 5 (p. 97); thunderstorm, f.n. 157; survey problems, f.n. 157-8; source, reference 106 (p. 202); Raurimu spiral, 312-5.
Clarke, H. T.: report from, 26-9.
Clayton, Wm. H.: Colonial Architect, 31; transfer to Public Works Department, 32; died, 50; listed, 305.
Coates, J. G.: Minister of Public Works, 99; portrait (*illus.*), 99; mechanisation, 102; workers agreement, 106; planning, 108; Main Highways Board, 110; general availability of electricity, 114; contracts, 116; unemployment, 118; story, f.n. 117; reduction in budget, 123; Memorial Church, 267; listed, 301.
Collie, Scott and Wilkinson: petition, f.n. 23.
Collins, A. S.: member for Collingwood, f.n. 19.
Consolidated Zinc Proprietary Ltd.: water rights, 250.
Conyers, Wm.: appointed Commissioner of Railways Middle Island, 37; stores procedure, f.n. 37.
Cooper, G. S.: listed, 302, 304.

Daish, J. R.: housing study, 221.
Dale, Frank: chainman, 314.
Dassler, C. W.: source, reference 38 (p. 119); author, reference 103 (p. 260); paper, f.n. 262.
Dominion Salt Ltd.: assistance to, 257.
Downer, A. F.: Rimutaka tunnel, 215-6; survey camps, 234.
Downer, with Morrison-Knudsen: contractors Rimutaka tunnel, 215-6.

Elias, Wm.: petition, 47.
Elliott, H. J. H.: biography, 279.
Emery, F.: worker participation, 73-4.
Eniko: opposition to Rochfort, 307.

Faulkner, A.: policy for department, 211.
Featherston, I. E.: first Agent-General, 22;
Fergus, T.: statements and quotations, 63; listed, 301.
Firth, C.: author, references 4, 5, 77, 78 (pp. 258-9).
Firth, J. C.: river works done privately, f.n. 50.

*Names of many corporate bodies will be found in the General Section.

- Fitzherbert, Wm.: proposed Public Works Department, 7; discussion on Bill, 8; Secretary for Crown Lands and Immigration, f.n. 10; suggestions, 17.
- Fletcher, James: Defence Construction Council, 165; portrait (*illus.*), 166; Commissioner of Defence Construction, 167; Order affecting labour, 171; initial concept of Ministry of Works, 178; Commissioner of Works, 179; views on Semple, 198.
- Fox Ministry: fall of, 16, 263.
- Fraser, Peter: cartoon (*illus.*), 147; Prime Minister, chairman Defence Construction Council, 165.
- Fraser, Sir Wm.: Minister for Public Works, 100; listed, 301.
- Froude, J. A.: quote from *Oceana*, 36.
- Furkert, Bruce: references 3 (p. 118); 8, 39 (pp. 133-4).
- Furkert, F. W.: qualities, 68; appointed engineer-in-chief and under-secretary, 68; transferred to Ohakune, 81; stories, 81-2; Permanent Head, 99; portrait (*illus.*), 99; appointment to service; qualities, 100; overseas visit, f.n. 115; salary, 118; criticism re Arapuni, 120-1; recommendations endorsed, 121; unwilling to dismember department, 125; final report, 125 personal attacks, 125; ceased duty, 126; left son's wedding, story, 131; listed, 302, 303.
- Fyson, J. H.: reference 170 (p. 261).
- General Contractors Federation: well established, 210.
- Gibb, Sir Alex. and Partners: detailed designs, 213.
- Gibson, E. A.: pioneered aerodromes activity, 149.
- Gilkison, J. T.: listed, 302.
- Gisborne, Wm: Minister *ad interim*, 9; appointment terminated, 11; re employment of Maoris, f.n. 29, 30; quotation, 262; listed, 301.
- Godfrey, G. C.: listed, 304.
- Goosman, W. S.: Minister of Works, 203; work allocation, 209; contract work, 211; overseas consultants, 212; highways, 231; accelerate hydro work, 236; Maraetai II, 240; listed, 301.
- Grey, Sir George: handling of depression, 45.
- Grover, D. M.: listed, 304.
- Hales, Wm.: track, 54, 306; promoted, 66; relations with under-secretary, 67; retirement, 67; endorses co-operative contracts, 74; listed, 302, 303.
- Hall, John: listed, 301.
- Hall-Jones, Wm.: Minister, 69; portrait (*illus.*), 70; story "Parliamentary Special", 81-2; quotations, 90, 93; listed, 301.
- Hamilton, Adam: Minister; quotation, 136.
- Hancock, L. M.: survey hydro resources, 90.
- Hanson, F. M. H.: neglect of roading, 192; quote, 203; Rimutaka tunnel, 215-6; highways, 231; department's functions, 257; listed, 302.
- Harrington-Smith: overseer, 196.
- Harris, A. G.: reference 4 (p. 118); earthquake intensity, 131-2.
- Haskell, D. O.: naming of Nonoti, 86; quote, 99; story cylinders during earthquake, 132-3; reference 33 (p. 134); appreciation work at Mohaka, 141; in Aerodromes Branch, 149; grass on billiard ball, 152; encourages an idea, 196.
- Hasman, C.: sources, references 14, 31 (p. 119); 102, 103 (p. 202).
- Houghton, C. E.: Crown Lands and Immigration, 262.
- Hay, J. J.: in charge at Ohakune, 81.
- Hay, P. S.: engineer-in-chief, 68; Superintending Engineer, survey of hydro resources, 90; listed, 303.
- Herbert, C. M.: thesis, f.n. 102; quotation, 108; references 10, 30, 53, 54, 55 (p. 119); 23 (p. 134).
- Hermans, Frank: story, 130.
- Heron, G. W.: thesis, f.n. 19; references 42 (p. 35); 2 (p. 60).
- Hetaraka Nero: letter, reference 73 (p. 35).
- Hobson, Capt. Wm.: first governor, 1.
- Holland & Hannen and Cubitts Ltd.: English contractors, 213.
- Holmes, R. W.: materials for concrete, f.n. 21; N.I.M.T.R.: investigations, 54; engineer-in-chief, 68 under-secretary, 68; portrait (*illus.*), 68; views on roading, 86-7, 90; bridges, 90; efficient, f.n. 90; university study leave, 96; Milford Sound road, 154; listed, 302, 303; Raurimu spiral, 314.
- Hornell, Professor: reviews hydro projects, 121.
- Hume, H. L.: listed, 303.
- Huriwaka: opposition to Rochfort, 307.
- Hursthouse, C. W.: N.I.M.T.R. surveys, 52-4; imprisoned by Maoris, listened to execution plans, 53; completed survey, 53-4.
- Hutchings, N. E.: listed, 304.
- Iko: canoe crew, 308.
- Iron and Steel Investigating Company: assistance to, 257.
- Irvine, C. D.: advocated appointing civil engineer as under-secretary, 42.
- Jenkins, A. C.: attended university, f.n. 97.
- Johnston, W. W.: listed, 301.
- Jones, G. J.: discusses early roads, 3.
- Jordan: contractor near Tauranga, 28-9.
- Joseph, Sister Maria: lay missionary, 308.
- Kaiatua: opposition to Rochfort, 307.
- Keller, G. P.: Rimutaka tunnel, 216.
- Keller, Peter: extract from "Notes", f.n. 85; references 53-5 (p. 98).
- Kemp, Major: Maori chief assisted Rochfort, 54, 306-10.
- Keys, L. J.: introductory note, 135.
- Kissel, F. T. M.: overseas visit, f.n. 115; listed, 305.
- Knowles, Jno.: first under-secretary, 42; biography, 280; opinion of Blow, 282; listed, 302, 304.
- Laing, P. L.: listed, 302.
- Langbein, F.: listed, 303.
- Larnach, W. J. M.: appointed Minister, termination, 37; listed, 301.
- Lawrence, C. A.: Parliament Buildings competition, f.n. 95.
- Macandrew, James: became Minister of Public Works, 39; instituted divided control, 39; critical description, 48; refutes provincialism, f.n. 48; listed, 301.
- Macdonald, W. D. S.: listed, 301.
- McIntyre, Peter: on architecture, 222; environment at Tongariro, 248.
- McKenzie, C. J.: listed, 302, 303.
- McKenzie, Roderick: Minister, 80; listed, 301.

- McKillop, E. R.: attended university, f.n. 97; deputy to Fletcher, f.n. 167; Commissioner of Works, 183; portrait (*illus.*), 183; listed, 302.
- McKinnon, I. W.: reference 11 (p. 160).
- Mackay, J. H.: listed, 302.
- McLean, Sir Donald: Maori labour cheaper, 31.
- Madden, E. A.: grass on billiard ball, 152.
- Magill, B. C.: listed, 304.
- Mahuki: Hursthouse hold-up, 52-3.
- Mair, John T.: architects relationship to engineers, 186-7; listed, 305.
- Manurewa: opposition to Rochfort, 307.
- Marot, Father: Catholic missionary, 308.
- Mason, Wm.: first Superintendent of Works, 1.
- Massey, W. F.: story told, 80; Memorial, 267.
- Matuahu: Rochfort visits, 310.
- Maxwell, J. P.: General Manager of Working Railways, f.n. 24; lack of stationmasters, f.n. 24.
- Melser, P. J.: housing studies, 221.
- Merz and McLellan: detailed designs, 213.
- Mitchelson, E.: decries Seddon's Statement, 66; listed, 301.
- Moffatt: murder, 310-1.
- Morrison-Knudsen-Downer companies: contractors Rimutaka tunnel, 215-6.
- Mulgan, John: quotation, 120.
- Nash, W.: cartoon, 147.
- Nevill, A. de T.: planning difficulties, 254.
- Newnham, W. L.: retired, 187; listed, 302, 303.
- Newsham: assistant to Hursthouse, 53.
- New Zealand Refining Company: assistance to, 257.
- Ngatai: welcomed Rochfort, 310.
- Nika Waiata: troubled Rochfort, 306.
- Noonan, R. J.: references 27, 29 (p. 134).
- Norman, R. G.: design, 252.
- O'Connor, C. Y.: involvement Rakaia Bridge, 13; portrait (*illus.*), 42; appointed under-secretary, 42-3; earlier moves, 42-3; rivalry with Blair, 43; became marine engineer, letter of acceptance, 44; to Western Australia, 44; staff changes, qualities, 67; report Nelson Creek water race, 71; listed, 302, 304.
- Oliver, R.: listed, 301.
- Oliver, W. H.: quotations, 48; references 53 (p. 61); 9 (p. 97).
- Ormond, J. D.: appointed Minister of Public Works, 11; portrait (*illus.*), 12; alleged malpractice, 17; Chinese labour, 24; quote, 36; resigned, 37; listed, 301.
- O'Rorke, G. M.: Secretary for Crown Lands and Minister for Immigration, f.n. 10, 262.
- Paora Patapu: Kemp's messenger, 307-8.
- Parry, E.: reports on future hydro developments, 92; listed, 305.
- Passmore, F. B.: superintending engineer, 37.
- Patchett, C. M.: reference 40 (p. 161).
- Patena: canoe crew, 308.
- Paton, Claude: Parliament Buildings, 95.
- Patterson, R. A.: wartime demands, 167; aide to Fletcher, 167-8; listed, 305.
- Peehi Turoa: Maori chief, 309.
- Pickering, B. B. M.: thesis, f.n. 90; references 77, 81 (p. 98).
- Pita te Rahui: Rangataua Block, 306.
- Plishke, E. A.: architect, f.n. 223.
- Porter, John: soil conservator, f.n. 163.
- Potatau: canoe crew, 308.
- Price: contractor, Nelson Creek water race, 71.
- Prichard, A. M.: in Aerodromes Branch, 149; start of aerial top dressing, 196.
- Professional Engineers' Association: shortage of engineers, 189.
- Puttick, Major-General: report on tanks, 173.
- Rangihuatau: opposition to Rochfort, 307.
- Ransom, E. A.: listed, 301.
- Raukawa: opposition to Rochfort, 307; private advice, 308; messenger, nearly shot, 309.
- Reed, A. H.: quoted, 5; reference 5 (p. 6).
- Reid, D.: Minister for Public Works, f.n. 10; listed, 301.
- Remona: Maori chief, 306.
- Rewi (Manga) Maniapoto: Maori chief at Kihikihi, 55, 310-1.
- Richardson, Edward: shipping delays, 22; staff reductions, 50; technical knowledge, 60; listed, 301.
- Richmond, James: source for engineers, 11.
- Riddell, J. O.: quotation, reference 46 (p. 161).
- Ritchie, R. F. D.: quoted, references 30 (p. 161); 160 (p. 261).
- Robb, Dr J. H.: critic of housing, 221.
- Roberts, Stephen: listed, 304.
- Robinson, Neil C.: sources, f.n. 167; references 13, 18-22, 37, 57, 58, 62 (pp. 200-1).
- Rochfort, John: surveys Wellington northwards, f.n. 21; portrait (*illus.*), 54; N.I.M.T.R. investigations, 54-5, 306-11; reports, 55; difficulties with Maoris, 306-11; later surveys, 314.
- Rollaston, Wm.: quotation, 67.
- Rosanowski, G. J.: references 50, 51, 55, and 56 (p. 61).
- Roth, H.: quote, reference 41 (p. 35).
- St. John, Lt.-Col.: engaging Maoris in useful work, 30.
- Salmon, Dr J. T.: Waikaremoana, Aratiatia, 247; scenic reserves, 252.
- Savage, Dr J. L.: American consultant, 211.
- Searle, J. N. L.: listed, 304.
- Seddon, R. J.: portrait (*illus.*), 64; appointed Minister, 64-5; effect on department, 65; visited works, 65; condemned for this, 65-6; relationship to technical department, 66; claimed department overmanned, 66; dismissed staff, 66; initiated co-operative contracts, 72; unemployment relief, 73; need for economy, 93; listed, 301.
- Semple, Robert: letter to newspaper, 84-5; Minister, introductory note, 135; portrait (*illus.*), 135; quotations, 137-8, 141-2, 145-6, 148-9, 152-3, 162, 165, 188-9, 199, 231; good conditions a right, 138, 142; interference on works, 143-5; jealous of position, genuine enthusiasm, 145; cartoons (*illus.*), 147, 198; someone to blame, flair for publicity, crushed wheelbarrow, 148; "tank" (*illus.*), 172; planning agency, 188; end of ministry, summary, 197-9; staff relations, 199; listed, 301.
- Shand, Thos.: Maraetai II, 241.
- Shaw, Savill & Albion Coy.: monopoly, 22; contract, f.n. 22.
- Sheppard, F. G. F.: listed, 305.
- Short, W. S.: appointed under-secretary, qualities, 68; portrait (*illus.*), 69; conducted inquiry, 77; biography, 284 listed, 302, 304.

Simkin, C. G. F.: reference 11 (p. 6); economic conditions, 44-5; references 39, 40 (p. 61).
 Sinclair, Keith: quotations, 48, f.n. 209.
 Smart, E. C.: in aerodromes branch, 149.
 Sorrenson, M. P. K.: reference 63 (p. 35).
 Soulas, Father: Catholic missionary, 308.
 Spence, Sir Basil: the "Beehive", 228.
 Spooner, B. W.: listed, 303.
 Stacpoole, J.: references 1, 2 (p. 6).
 Stafford, E. W.: ministry, f.n. 10; motions defeated Government, 16.
 Stewart, Downie: quotation, f.n. 109.
 Stewart, J. T.: visits to Wellington, 15.
 Stirrat, A. G.: listed, 303.
 Stone, R. C. J.: quoted, reference 12 (p. 6).
 Stout, Robt.: private interests, 48.
 Sutch, W. B.: source, reference 99 (p. 202); foreign concerns, 213-4; atlas versus motorway, 236.

Tancred, T. S.: involvement Rakaia Bridge, 13.
 Tasman Pulp and Paper Company: facilities needed, 211; rail connections, 211, 263; buildings (*illus.*), 212; test bores, 278.
 Taumata: averse to railway, 307; obstructive, 309.
 Taurere: moderate opposition, 307.
 Taverner, W. B.: listed, 301.
 Tawhiao: request for letters, 308.
 Taylor, Jos.: petition, f.n. 23.
 Te Aurere: opposition to Rochfort, 307; canoe crew, 308.
 Te Heuheu: in party, 308; Rochfort visits, 310.
 Te Kuru Kaanga: opposition to Rochfort, 307; canoe crew, 308; obstructive, 308-9.
 Te Mahuki: led party Hursthouse hold up, 52-3.
 Te Oeo: opposition to Rochfort, 309.
 Te Peehi: opposition to Rochfort, 307; canoe crew, 308; in party, 308.
 Te Whaiti: opposition to Rochfort, 307.
 Topia Turoa: Rochfort visits, 310.
 Tuhiora: Maori chief, 310.
 Tuke, Inspector A.: A. C. work not at fault, 26.
 Tullett, J. S.: author, reference 118 (p. 202).
 Turangatahi: Maori chief, 310.
 Turehu: opposition to Rochfort, 307.
 Turner, A. C.: Resident Engineer, Tauranga, 27-8.

Turner, C. B.: surveys, 314.
 Turner, C. W. O.: listed, 303.
 Tyndall, A.: engineer Main Highways Board, 114.

Vickerman, H.: on inquiry commission, 195.
 Vogel, Julius: Public Works policy, 6, 7; portrait (*illus.*), 7; demand for railways, 15; Brogden contracts, 19-20; eulogises civil servants, f.n. 45; private interests, 48; expenditure reduction, 49.

Wahanui: Maori chief, 55; request for letters, 308; at Kihikihi; 310.
 Waterhouse, G. M.: Ministry, f.n. 10.
 Waterson, D. B.: quotation, 78; examples, 80; Coates policy, 109; references 1, 11, 15 (pp. 118-9); 2 (p. 133).
 Watt, Hugh: Cook Strait cable, 238; scenic attractions, 249; listed, 301.
 Weber, Karl H.: early career, 10; outside pressures, 47.
 Wetera te Ringaringa: guide to Hursthouse, 52.
 White, D. U.: reference 57 (p. 161).
 Williams, Geo. Phipps: N.I.M.T.R. investigations, 54.
 Williams, K. S.: listed, 301.
 Wilson, F. Gordon: flats (*illus.*), 220; Government Architect, 223; "places to go to", 236; listed, 305.
 Wilson, J. J.: improvement in Maoris, 30.
 Winiata te Kakai: opposition to Rochfort, 307; canoe crew, private advice, 308.
 Wood, John: listed, 302, 303.
 Wood, R. G.: opinion of Vogel's scheme, 8.
 Woon, R.: helped Rochfort, 307-8.
 Wright, Joe: quote, 99.
 Wright, T. M.: attended university, f.n. 97.

Zschokke, Conrad, S. A.: Swiss contractors, 213.

GENERAL

Abbreviations, key to, xv.

Accommodation, workers: shortage, conditions, 76, 101; agreement requirements, 106; revised standards, 138; camp (*illus.*), 153; huts, 317.
 Accountant, chief: views on reorganisation, 185.
 Acts: administered, 276.
 Addington: railway to Kaiapoi, f.n. 5.
 Administrative Division: heads of, 304.
 Advisory: services, 278; Committee on Higher Salaries, 208.
 Aerial top dressing: beginnings and difficulties, 196-7; in action (*illus.*), 197.
 Aerodromes: scheme for, 130; construction, 130-1; mechanisation, 146; separate branch, procedure, 149; early moves, f.n. 149; concrete hangars (*illus.*), 150; developments, 152; war-time projects; survey and construction in Pacific, 175-7; in Fiji (*illus.*), 175; Wellington, 254-5; (*illus.*), 254.
 Agent-general, London: appointment, 262.
 Agreement with union: *see* New Zealand Workers Union.
 Aka Aka, near Pukekohe: relief camp, 129.
 Akatarawa: relief camp, 129.
 Alcohol: forbidden in camps, f.n. 142.
 Alexandra: engagement of racemen, 130.
 Alexandra (Pirinoa): edge of civilisation, 53.
 American: troops arriving, 165; camps for (*illus.*), 174; tunnel section, 193; faulty gear, 238; consultant, 254; accommodation for troops, 269.
 Aqueduct: lined (*illus.*), 248.
 Arapuni power development: story of contract, 117; shutdown, 120; dam (*illus.*), 121; additional generators, f.n. 162; final units, 191; transmission line to Edgecumbe, 211; completion, 265.
 Aratiatia power scheme: additional plant, 240; completed, 241; concrete surge tank, 242; surroundings, 247-8; completion, 265.
 Architects Branch: Colonial Architect transferred, 32, 266; died, not replaced, 50; branch understaffed, 50; development, 93; important, 95; expansion and criticism, 116; war effort, 167; standardisation and prefabrication, 174-5; districts, 183; relations with engineers, 186-7; staff shortages, 206-8; separate division, 266; heads of, 305.

- Ardmore: aerodrome extension, 176.
- Arline Creek: on spiral, 312.
- Armed Constabulary: use as labour, 24-6; strength of, f.n. 26.
- Army: work for, 164; helped to form units, 165; tractors converted to tanks, 172-3; machine-gun posts, 174.
- Arthurs Pass tunnel: early proposals, contract let, Department takes over, 83; difficulties and conditions, 84; closure measurements, 85; pressure to finish, f.n. 85. concern for environment, 243-4.
- Ashburton: p. & t. office (*illus.*), 92; Lyndhurst irrigation scheme, 152; River control, 273.
- Atiamuri: earthquake at, 57.
- Atiamuri power scheme: investigations, 192; detailed designs, 213; additional plant, 240; completion, 265.
- Auckland: capital, 1; railway gauge, f.n. 5; capital transferred, 6; railway south, f.n. 13; Chamber of Commerce, f.n. 22; commission on railways, 37; route to Wellington, f.n. 57; post office (*illus.*), 95; h.q. of district, 182; architects districts, 183; multi-storey flats, 219; hospital, 226; university (*illus.*), 227; motorway (*illus.*), 235.
- Auckland-Mercer railway: proposals, 13; Brogden contract, f.n. 19.
- Australia: staff loss to, 212.
- Aviemore power scheme: completion, 265.
- Awakaponga: rail junction, 211.
- Bay of Plenty: log transport, 233; resources survey, 272.
- Benmore power scheme: in hand, 238; lake (*illus.*), 239; completion, 265.
- Biographies: early personalities, 279-85.
- Blenheim: to Nelson road, 57.
- Bluff: aluminium smelter, 250.
- Board of Control: suggested, 17-19.
- Bodies: representation on, 276-7.
- Braeburn power scheme: investigations, 192.
- Bridges: (*illus.*), Otira, 3; Manawatu, 33; Waimakariri, 49; Makohine, 79; Mohaka, 139, 229; Waiau, 193; Kawarau, 228; lower Haast, 245; built too low, 87; unsafe; narrow to restrict loads, 90; where justified, f.n. 90; Bailey, heavy loading, 231; design, 252.
- British Government: requests description of railways, f.n. 31.
- Broadcasting House: complexity, 226.
- Broken River: workers' conditions, 77.
- Building: Controls, non-essential work suspended, 166; summary of measures, 167; control, 269.
- Buildings, Public: Supreme Court, Wellington (*illus.*), 51; Govt. Printing Office (*illus.*), 56; Courthouse, New Plymouth (*illus.*), 92; Bell's report 1890, 93; Public Trust, Wellington (*illus.*), 96; role of engineer, 133; wartime construction, 167; shortage, 204; expenditure over periods, 217; considerations, 223; standard plans, 223; need acute, variety, 225; complexity, 252; story, 266; maintenance, 267.
- Buller River: tools dumped in, 146.
- Buses: inspection of, 271.
- Cabinet: works committee, 275.
- Cadets: engineering, 23; recruitment of, university study leave, 96.
- Caissons: use at Mohaka, 132.
- Camps: life in (*illus.*), frontispiece, 76, 85, 104-5, 127, 140, 153, 155-6, 159; conditions, 76-7, 101; alcohol forbidden, f.n. 142; military (*illus.*), 174.
- Canteens: provision for, 138; text in agreement, 317.
- Canterbury: early railways, 4, f.n.'s. 5, 13; irrigation, 152; district, 182-3; university (*illus.*), 225-6.
- Cartoons: of Fraser, Semple and Nash (*illus.*), 147; of Semple (*illus.*), 198.
- Cass: camp conditions, 77; steam navvy (*illus.*), 94.
- Castlepoint: lighthouse (*illus.*), 94.
- Cement: shortages, 204; works closed, 205.
- Cemeteries: maintenance, 267.
- Central Otago: irrigation, 93, 115; Chatto Creek (*illus.*), 115; work continues, 123; link with Westland, 160.
- Charleston: water race, f.n. 22.
- Chatto Creek: siphon (*illus.*), 115.
- Chinese: immigration of, 24.
- Christchurch: railway to Selwyn, f.n. 5; to Rangiora and to Rakaia, f.n. 13; h.q. of district including architects, 182-3; university buildings (*illus.*), 225-6; Lyttelton tunnel (*illus.*), 246; Lyttelton road tunnel, 278.
- Christchurch-West Coast Railway: *see* Midland Railway and Midland Railway Company.
- Civil Construction Unit: story, 175; runway (*illus.*), 175.
- Civil Defence: role in, 268.
- Civil Service Commission 1880: appointed, 45; Department condemned, 46; findings not universally accepted, f.n. 45.
- Cleddau Valley: on route to Milford Sound, 154-7; canyon (*illus.*), 244.
- Coaches: (*illus.*), 16, 17, 88.
- Coastwatching: expeditions, 177.
- Cobb River power scheme: construction, f.n. 162; operating, 191; extensions, 238; completion, 265.
- Coleridge hydro: *see* Lake Coleridge.
- Comalco: owners Bluff smelter, 250; original agreements, 257.
- Commissioner of Defence Construction: James Fletcher appointed, 167.
- Commissioner of Works: initial concept, 178; specific tasks, 178-9; overriding control, 181; permanent head, 188; staff comparisons, 189-90; quotation, 203; labour shortages, 205; staff shortages, 206-7; overseas designs, 214; variable foundations, 234; visit to Lardarello, 243.
- Commissions: Auckland railways, 37; Civil Service 1880, 45; Rivers, 87; National Expenditure 1932, 124-5; on New Zealand State Services, f.n. 208; Kaimai Tunnel disaster, 211; on Railways, 231; Roading Investigation, 231; Inquiry, level of Lake Manapouri, 251.
- Computers: introduction, 255.
- Concrete: difficulties with materials, f.n. 21; machine-gun posts, 174; pre-stressed, 234.
- Conditions, workers: union agreement, 106, 316-7; 1936 agreement, 138; construction towns, 190-1.
- Conservation: *see* under Soil, Water and Rivers.
- Construction: camps (*illus.*), frontispiece, 76, 104-5, 140, 153, 155, 159; methods (*illus.*), 18, 25, 58, 83-5, 89, 102, 122, 147, 151, 154, 156, 158; headquarters (*illus.*), 85; suitability of methods, 195; apportionment of capacity, 204; Savage report, 211-2; cost increases, 216-7; difficulties, 255; activities, 267; workers agreement, 316-7.
- Consultants: employment of, 208-9; overseas, 213; disadvantages of overseas, 214.
- Contractors: English, f.n. 19; supplying quantities to, 48-9; attack on, 71-2; continued use of, 78; overseas, 116-7, 213; wartime difficulties, profits, 170; greater use of, 203, 208-9; conflict of interests, 210.

Contracts: awarding, 19; Brogden, 19–20; overheads in estimating, f.n. 20; assessing, 21; petitions, 23; lowest tenders, 23, 71; attack on system, 71–2; co-operative, 72–6; Tenders Board, 80; revival of system, 116; suspension of tendering, 167; other systems, 168; master schedules, 169–70; extension, 203; results, cost check, 209–10.

Controls, building: not enforced, 166; still required, 204; relaxed, 205; story, 269.

Convoy: early settlers (*illus.*), 15.

Cookhouses: provision for, 138.

Cook Strait cable: investigations, 238.

Co-operative Contracts: introduction, 71; how started, 72; advantages, 72–3; types of work, 74; opposition, 74; comparison of costs, 75; selection of men, f.n. 75; conditions on works, 75–8; Makohine viaduct, 79; alleged degeneration, 120; endorsed by Semple, 138; covered in agreement, 316.

Courthouse: (*illus.*), New Plymouth, 92.

Crown Lands Department: took immigration, 10; chief clerk transferred, 279.

Crushers: metal (*illus.*), 89.

Culverden: railway to Waiau, f.n. 101.

Dams: (*illus.*), Arapuni, 121; Waitaki, 123; Karapiro, 191.

Defence: buildings work to transfer, 51; Works Department's role, 164–5, 269; Works Labour Legislation suspension Order 1942, 171; took over public buildings, 266; maintenance of establishments, 267. *See also under* "War".

Defence Construction Council: established, 165; first meeting, 168.

Depression: conditions 1870–80s, 44–5; helped union's decline, 108; effects of, 120; many works closed, 123; wage reductions, beginnings, 124; Department's activities, 126, 268; single mens camps, 126–8; road widening (*illus.*), 127; effects and difficulties, 138–41.

Disasters: department's role, 268.

Dunedin: primitive conditions, 1; in 1861 (*illus.*), 2; early railways, to Port Chalmers, f.n. 5; to Waitaki, f.n. 14; Law Courts, 95; placing servicemen, 101; sealing (*illus.*), 111; h.q. of district, 182.

Dunedin-Clutha railway: proposed, f.n. 13; Brogden contract, f.n. 19.

Early New Zealand Engineers: f.n. 1; reference 6 (p. 6); refs. 12, 15, 25, 81 (pp. 34–5); refs. 38, 71 (p. 61).

Earthquake: description of, 57; Napier, stories re, 131; damage to railway, 137.

Earth wagons: (*illus.*), 18, 58.

East Coast Main Trunk Railway: Tauranga westwards contract, 116; new connections, 211, 263.

Economy: instability, 6; conditions 1870–80s, 44–5; collapsing, 118; deteriorating, 120; public works key factor, 136, 217.

Edgumbe: terminus transmission line, 211.

Eglinton: on route to Milford, 157.

Electric: Acts, 1884 and 1896, f.n. 90; power supply story, 264–5.

Encyclopaedia of New Zealand: reference 74 (p. 61).

Engineers: shortage of, 23; professional standards, 46–7; heads of division, 303.

Environment: consideration for, 243; in early times, 243–4; symposium, 244–6; other projects, f.n. 251.

Erewhon: early post office, 55.

Expenditure: annual construction, 294–5; total proportioned, 296–7.

Experts: overseas, 83; re Arapuni, 121; opinion of, f.n. 121.

Farewell Spit: lighthouse (*illus.*), 94.

Ferry: river crossing (*illus.*), 4, 94.

Fiji: aerodrome construction, 175; runway (*illus.*), 175.

Fire precautions: almost non-existent, 93.

Fishing: at Tongariro, 252.

Flood control: *see* Rivers control.

Floods: damage to roads, 87.

Fordell tunnel: *see* Turakina.

Fortifications: at main ports, 59.

Fuel: supply of, 138; text in agreement, 317.

Functions: of Department, Appendix I, 262–278.

Galatea: road to Ahikereu (*illus.*), 25;

to Waikaremoana (*illus.*), 127.

Gauges: early railway, 5, 14.

Geothermal power: Italian field f.n. 115; investigation, 238; drilling (*illus.*), 242–3; Wairakei in use, 243; location, 299.

Gertrude Saddle: discarded as route to Milford Sound, 157.

Gisborne: road sealing (*illus.*), 112; part of Hawkes Bay district, 182; opposition to changes, 184–5; airport, 267.

Gold: discovery, 3; mining, 22.

Gore: opening railway to (*illus.*), 20.

Government Buildings: (*illus.*), Invercargill, 32; Wellington, 32, 57, 131; Lyttelton, 56.

Government House, Wellington: Campbell's work, 95.

Government Printing Office: (*illus.*), 56; special requirements, 226, 266.

Graders: departmental design, f.n. 131.

Grades: explanation of, 312.

Grahamstown: station at, 48.

Greenstone: on Holmes route to Milford, 154.

Grey Gorge Suspension Bridge: accident, 13.

Greymouth: harbour works, f.n. 64; part Canterbury district, 182.

Haast: South Westland - Otago link, 160; river bridge (*illus.*), 245.

Hahungatahi: Rochfort's survey, 307.

Hale's track: used by Rochfort, 54, 306.

Hamilton: headquarters of district, 182; housing (*illus.*), 218; lowering railway, 263.

Hangars: concrete (*illus.*), 150.

Hangatiki: alternative N.I.M.T. route, 54.

Hapuawhenua: camp life (*illus.*), frontispiece; viaduct costs, 79.

Hastings: southern terminus alternative N.I.M.T. route, 54.

Hawkes Bay: early railway proposal, f.n. 14; exploration Te Awamutu to, 52, 54; district, 182; architects under Wellington, 183.

Headings: on plans and communications, 31.

Heads: of Department, 302; of engineering division, 303; administrative division, 304; architectural division, 305; hydro-electric branch, 305.

Hermitage, Mount Cook: relaxed design, 95.

Herurarema: Rochfort's description, 308–9.

Highbank power station: construction, f.n. 162; completed, 191, 265.

Highways: *see under* Roading.

Hinds: irrigation scheme, 152; river control, 273.

Hokitika: aerodrome, 130.

Holidays: provision for, 138; text in agreement, 317.

- Hollyford: on route to Milford Sound, 154; road construction (*illus.*), 154-9.
- Homer Saddle Tunnel: on route to Milford, 154; started, 157; heading (*illus.*), 157; avalanches, 158; contract, 160.
- Hope Saddle: coach (*illus.*), 17.
- Horopito: service road, 81.
- Horse hire: text in agreement, 317.
- Housing: Construction Department, 163-4; individuality (*illus.*), 163; reorganisation, 180-2; construction towns, 190; situation acute, 204; staff shortage, 207; comparative costs, 216; comparative expenditures, public utility, 217; changing attitudes, 218; new look (*illus.*), 218; importation, f.n. 219; limited scope, high rise flats, 219; flats (*illus.*), 220; entire townships, studies, 220-1; story, 266.
- Huriwhenua: name of wharepuni, 308.
- Hutt Valley: railway deviation, 263.
- Hydro-electric Branch: formation, 115; separate department, 180-2; civil work returned, 181; staff shortages, 206; story, 264-5; heads of, 305.
- Hydro-electric development: early moves, reasons for delay, 90; electrical engineer appointed, Lake Coleridge operating, 91; Parry reports, 92; Coates objective, 114; dual roles, separate section, 115; most works closed, 123; resumed, 162; rapid increase, 191; power shortages, 204; staff shortages, 206; Savage report, 211-2; comparative expenditures, 217; continued development, Cook Strait cable, 236-42; general story, 264-5; locations (maps), 299-300.
- Hydrology: surveys, 253.
- Immigration: separation from Public Works, f.n. 10; story of initial connection, 262.
- Immigration and Public Works Bill (Act): discussion, provisions, 8; Board of Control, 17.
- Imperial forces: road building, 6.
- Industry: promotion of, 257.
- Information: unauthorised release, 49.
- Inspection: of machinery, 270; of tramways and trolley buses, 270.
- Inter-island power connection: *see* Cook Strait cable and hydro-electric development.
- Internal Affairs Department: wildlife division, 252.
- Invercargill: early railways to Bluff and Winton, f.n. 5; excursion train (*illus.*), 20; post office (*illus.*), 32.
- Invercargill-Mataura Railway: proposed, f.n. 14; Brogden contract, f.n. 19; railway opening (*illus.*), 20.
- Investigation: importance of adequate, 195.
- Irrigation: initiation of schemes, 93; expansion, 115-6; siphon (*illus.*), 115; work continues, 123; water rates unpaid, f.n. 123; incident with race-man, 144; intake structure (*illus.*), 150; Rangitata scheme (*illus.*), 151; shift to Canterbury, modern methods, 152; continued during war, f.n. 162; operation and maintenance, 267.
- Johnsonville: sealing (*illus.*), 110; motorway north opened, 231.
- Kaimai Tunnel: disaster, 211; deviation, 263.
- Kaitawa hydro scheme: *see* under Lake Waikaremoana upper development.
- Kaitoke: waterworks, 278.
- Kaituna power scheme: investigations 192.
- Kaiwhaiki: Rochfort's trip, 308.
- Kapuni: natural gas, 243.
- Karapiro power scheme: construction, f.n. 162; (*illus.*), 191; completed, 191, 265.
- Karioi: opposition met, 54, 306.
- Kawarau River: bridge (*illus.*), 228.
- Kawarau: paper mill, 211; rail connection, 211, 263; township, 211; buildings (*illus.*), 212; test bores, 278.
- Kihikihi: Rochfort met chiefs, 55, 310.
- Kinleith: railway to, 263.
- Kiwitea: early post office, 55.
- Kopuawhara camp: disaster (*illus.*), 140.
- Koriniti: Rochfort's description, 308-9.
- Korokoro power station: proposed, 240.
- Kukuta: Rochfort's trip, 308.
- Labour: relations, 100; shortages, 101, 204-5; dispersal of, 101; Labour Legislation Suspension Order 1942, 171; turnover, 205.
- Labour Government: fear of, 130; elected, 135; started Housing Construction Department, 163; long-range planning, 188-9; defeated, 203; works policy, 211; housing, 217; public buildings, 225; Cook Strait cable, 238; industrial development, 257.
- Lake Coleridge hydro development: estimate, 90; commencement and completion, 91, 265; view of (*illus.*), 91.
- Lake Hawea control: investigations, 192; continued, 238.
- Lake Manapouri power development: investigations, 192; contract, 213; machine hall (*illus.*), 214-5; controversy, outline of development, 250-1; barge (*illus.*), 250; completion, 265.
- Lake Pukaki control works: in hand, 192.
- Lake Te Anau power: *see* under Lake Manapouri.
- Lake Tekapo: incident at tunnel, f.n. 144; investigations, f.n. 162; under way, 191; continued, 238; completion, 265.
- Lake Waikaremoana: camp (*illus.*), 127; road work (*illus.*), 155.
- Lake Waikaremoana power development: road improvements (*illus.*), 89; survey camp (*illus.*), 105; lower development in hand, f.n. 162; completed, 191; upper one in hand, 192; differing views, 247; completion, 265.
- Lake Wakatipu: route to Milford Sound, 154-7.
- Lake Wanaka: control investigations, 192.
- Land Improvement: depression activity, 126; continued during war, f.n. 162.
- Land Purchase: branch, 252; story, 272-3.
- Lands and Survey Department: f.n. 65; airstrip, 267; chief clerk, 284.
- Lardarello: geothermal plant, f.n. 115, 243.
- Leave, annual: provision for, f.n. 138.
- Legal: branch, 252; story, 272-3.
- Level crossings: elimination, 153.
- Liberal party: attains power, 72; unemployment relief, concern for labouring class, 73; promised railways, 80.
- Libraries: provision for, 138.
- Lighthouses: establishing, 1; construction, 10; views (*illus.*), Farewell Spit, Castlepoint, 94; construction and maintenance, 267.
- Local Authority Loans Board: reports by department, 114; story, 275-6.
- Lower Hutt: street scene (*illus.*), 163.
- Lyndhurst: irrigation scheme, 152.
- Lyttelton: railway to Christchurch, f.n. 5; tunnel portal (*illus.*), 5; Government Buildings (*illus.*), 56; tunnel, 193; road tunnel (*illus.*), 246; designed, 278.

- Machinery: inspection of, 270.
- Main Highways Board: antecedent conditions, 109–10; constitution, 110; Act, programme, effect of upgrading, 113; engineer, 114; unemployment relief camps, 126; state highways, 153; backlog of work, 204; continued as National Roads Board, 228; paper by Chief Engineer, 231; story, 264; first traffic inspector, 271.
- Main Trunk Railways: *see* North Island M.T. Railway, South Island M.T. Railway, East Coast M.T. Railway, Midland Railway.
- Makaretu River: on descent to Raurimu, 312.
- Makatote viaduct: costs, 79–80.
- Makohine viaduct: erection, 79; (*illus.*), 79.
- Manapouri, *see* Lake Manapouri.
- Manawatu Gorge: bridge (*illus.*), 33.
- Mangahao hydro development: conditions at, 101; union litigation, 108; completion, 265.
- Mangakino: construction township, 190; communist trouble, 191.
- Manganui-o-te-ao: viaduct costs, 79; Rochfort, 307–9.
- Mangapari Valley: surveys, 314.
- Mangawhero: post office 17 miles from Wanganui 55; early name for Ohakune, 307.
- Mangere: housing, 221.
- Mangorewa Forest Road: negotiations with Maoris, 26–9.
- Maori: use as labour, 24; problems, 26; opposition to roading, 29; painful readjustment, difficulties as a work force, 30; opposition to surveys, 52–5, 306–311.
- Maraetai power scheme: in hand, 191; faulty equipment, 238; second station halted, 238–240; re-started, 241; I completed, II approaching completion; 265.
- Marakopa River: idea for aerial top dressing, 196.
- Marine Department: freshwater division, 252; inspection of machinery, 270.
- Marine engineer: appointment, 10; O'Connor appointed, 44; supplied, 278.
- Marlborough: early railway, 13; divided control, 41.
- Marsden Point power station: completion, 265.
- Marton: Rochfort started survey, 54, 306; p. & t. office, 55.
- Master Schedule System: *see* Contracts.
- Matahina power scheme: completion, 265.
- Materials: delays, 22; shortages, 101, 204; programming, 270.
- Maui: natural gas, 243.
- Maungaturoto: coach bogged (*illus.*), 88.
- Mayfield: irrigation scheme, 152.
- Mechanisation: first steps, 93; early steam navy (*illus.*), 94; delays and start, 102; need for, 137; in late thirties, reduction in cost, 146; humanitarian grounds, fascination, 148; for war purposes, 165; helped post war, 205.
- Memorials: maintenance, 267.
- Meremere power station: peak loads, 240; completion, 265.
- Middle Island: Resident Minister, 11; discontinued, 12; under separate control, difficulties, 39–41; railways completed, 298.
- Midland Railway: advice ignored f.n. 19; unfavourable reports, 48; conditions in camps, 77; outline of construction, 82–5; plans for tunnel, 83; tunnel gang (*illus.*), 85; steam navy (*illus.*), 94.
- Midland Railway Company: contract with Government 82–3; plans for crossing divide, 83.
- Mileages: railways completed, 298.
- Milford Sound Road: 1890 report, 154; scenes (*illus.*), 154–9, 244–5; start made, 157; final survey, Homer tunnel started, 157; avalanches, 158; tunnel contract, 160; Milford Hotel, 266.
- Mills: name change to Wharanui, 86.
- Mines Department: established, 279; Blow appointed Under-Secretary, 282–3.
- Minister for Public Works: suggested appointment, 8.
- Ministers of Public Works/Works: list of, 301.
- Ministry of Works: Act passed, 177; functions of, 178; responsibility for planning, 188–9; takes Town Planning, 10-year plan, 189; combined with Public Works Department, 196; extension contract work, 203; precise function, 204; staff shortages, 205–7; recruitment overseas, 208; contractors, 209; different policies, 211; work outside country, 214; expenditure, 217; social problems, 236; Manapouri inquiry, 251; criticism of, 256; assistance to industry, 257; past and future roles, 257–8; functions, 262–78; construction activities, operation and maintenance, 267; role in disasters, 268; organisation charts, 291–2; expenditure, 294–7; railways completed, 298; list of Ministers of Works, 301.
- Mohaka: trouble at aerodrome, 141; river bridge (*illus.*), 229.
- Mohaka viaduct: men in cylinders during earthquake, 132–3; description, 138; (*illus.*), 139; completion, tribute from Semple, 141.
- Mokau: early post office, 55; near Falls (*illus.*), 155; River, 273.
- Mokihinui: railway, 72.
- Monganui: early roads, 2.
- Motor transport: first car Wellington-Auckland (*illus.*), 88; effect on roads, 109–10; licensing, traffic control, 271.
- Motorways: first section, 231; features, 232; (*illus.*), Wellington, 232, 237; Auckland, 235; effect on housing, 236; story, 263–4.
- Mount Cook: Hermitage, 95; aerial passenger ropeway, 267; Development Committee, 272.
- Mount Ida: water race, f.n. 22.
- Mount Maunganui: harbour facilities, rail link, 211, 263.
- Moutoa: fight at, 308.
- Murupara: railway to, 192, 263; logging town, 211.
- Nandi: extensions to airport, 175–6.
- Napier: railway proposal, f.n. 14; to Taupo road, f.n. 29; earthquake, 131; headquarters of district, 182.
- Napier–Gisborne railway: re-started, 136–7; Mohaka viaduct (*illus.*), 139; Kopuawhara disaster (*illus.*), 140; opening, 192; amended tunnel section, 193; Waiau viaduct (*illus.*), 193.
- Napier-Paki Paki railway: Brogden contract, f.n. 19; rival routes, f.n. 47.
- National Expenditure Commission: opinion of Department, introduction 120; proposals for Department, 124; P.W. Statement extravagant, f.n. 124; recommendations, 125.
- National Government: elected, promises and differences, 203; works policy, 209, 211; housing, 219; historical atlas axed, 236; Cook Strait cable, 238–40; future role, 257.
- National Roads Board: formation, 228; Roothing Division, 229; factors affecting change, 230; motorways, 231; priorities, 233; social problems, 236; story, 264.
- National Service Department: Semple's pride, 198.
- National Water and Soil Conservation Authority: established, 253; story, 273–4.

- Native Department: liaison with, 26; report from Civil Commissioner, Auckland, 26-9; Maori land purchase, f.n. 26.
- Native Minister: Hursthouse incident, 53; Rochfort, 55, 308-11.
- Natural gas: use of, 243; treatment plant, 267.
- Nelson: early railway, 13; difficulties of divided control, 41; road to Blenheim, to West Coast, 57; aerodrome, 146; part Wellington district, 182; opposition to change, 184; resources survey, 272.
- Nelson Creek: water race, f.n. 22, contract, 71.
- Newmarket: early railway to Drury, f.n. 5; viaduct, 235; (*illus.*), 235.
- New Plymouth: early railway proposal, f.n. 14; courthouse (*illus.*), 92.
- New Plymouth power station: environment, f.n. 251; construction (*illus.*), 251; in hand, 265.
- Newspapers mentioned and/or quoted: *Auckland Star*, 133, 161; *Christchurch Star-Sun*, 174; *Colonist* (Nelson), 61; *Dominion* (Wellington), 109, 145, 223, 240, 241, 259-61; *Evening Mail* (Nelson), 184; *Evening Post* (Wellington), 129, 147, 162, 198, 222, 232, 251, 259-61; *Evening Star* (Greymouth), 84; *Gisborne Herald*, 184; *Lyttelton Times* (Christchurch), 97; *Maoriland Worker* (Wellington), 119; *New Zealand Free Lance* (Wellington), 247; *N.Z. Herald* (Auckland), 7, 108, 119, 133-4, 148, 160-1, 202; *N.Z. Observer* (Auckland), 134; *N.Z. Worker* (Wellington), 133; *Northern Advocate* (Whangarei), 184; *Otago Daily Times* (Dunedin), 120; *Press* (Christchurch), 78, 202; *Standard* (Wellington), 255; *Weekly News* (Auckland), 251, 260.
- New Zealand Company: Knowles, 280.
- New Zealand Electricity Department: Manapouri inquiry, 251; Tongariro fishing, 252; early story, 264-5; civil consultant to, 278.
- New Zealand Engineering*: references 56, 57 (p. 97); editorial, 143; ref. 57 (p. 161); refs. 95, 96, 104, 105 (pp. 201-2); conferences, 210, 215-6; symposium, 244; other refs. 52, 67, 122, 123, 127, 163, 169, 170 (pp. 259-61).
- New Zealand Institute of Architects: Journal, references 88, 89 (p. 260).
- New Zealand Institution of Engineers: 1953 conference, 210; paper, 231; road symposium, 244.
- New Zealand Institution of Engineers Proceedings*: references 105, 106 (p. 260).
- N.Z. Journal of Agriculture*: aerial top dressing, f.n. 196.
- New Zealand Listener*: reference 28 (p. 97).
- New Zealand Society of Civil Engineers Proceedings*: f.n. 21; reference 37 (p. 34); f.n. 90; refs. 63-66, 71-73, 90 (p. 98); refs. 2, 6 (p. 118).
- New Zealand Workers Union: formation, 104; first agreement, 106, 316-7; difficulties, 107; enforcement, opposition, 108; alleged violation, 118; new agreement 1936, 137-8; initial resistance, 143; relations, 191; communist trouble, f.n. 191.
- Ngahuruheku: on Rochfort's survey, 306.
- Ngakawau-Mokihinui Railway: co-operative contracts, 72.
- Ngati-Maniapoto: Maori tribe, 310.
- Ninety Mile Beach: aerial seeding, 197.
- Nonoti: origin of name, 86.
- North Auckland: early roading, 4; Great North Road, 47, 57; railway camps, 77; conditions in, 101; resources survey, 272.
- North Island Main Trunk railway: Carruthers exploration, alternatives, the task, 52; imprisonment of surveyors, 53; other difficulties, 54-5, 306-11; route decided, 55-7; progress, work ceased, 57; rail and sea route f.n. 57; camps (*illus.*), frontispiece, 76; Makohine viaduct (*illus.*), 79; resumed, opened, 80; construction outline and stories, 80-2; rail and coach travel, f.n. 82; bush clearing (*illus.*), 84; construction headquarters (*illus.*), 85; conditions in tunnels, f.n. 85; description of spiral with diagram and illustrations, 312-5.
- Official War History, Aerodrome Services Branch: quotes from, 175-7.
- Official War History of the Public Works Department: quotes from, references 7-9, 11-2, 15, 23-36, 38-9 (p. 200-1); f.n.s. 165, 168.
- Ohakea: concreting of runways, 176.
- Ohakune: camp life (*illus.*), frontispiece, 76; Rochfort survey, 54, 306-11; headquarters, 80; siding, 81.
- Ohakuri power scheme: investigations, f.n. 162, 192; detailed designs, 213; additional plant, 240; completion, 265.
- Ohinemuri River: control works, 87, 273.
- Organisation: (*see also* Public Works Department) of department, 9; control by non-technical Minister, 122-3; importance of proper, 195; charts, 286-93.
- Organisation for National Development: to co-ordinate planning, 189.
- Otago: early roads, 3, (*illus.*), 15; early railways, 4, 13-4; gauge, f.n. 5; sealing (*illus.*), 111; link with Westland, 160; district, 182; architects under Christchurch, 183; resources survey, 272.
- Otago Central Railway: advice ignored f.n. 19; unfavourable report, 160 miles allocated, 48.
- Otara: housing, 219, 221; power station, 265.
- Otira: Gorge (*illus.*), 3, 16; conditions at, 101; concern for environment, 244.
- Otira tunnel: *see* Arthurs Pass tunnel.
- Otoko: viaduct, 79.
- Overtime: in agreement, 316.
- Pacific: extensions at Nandi, 175; works in, first line of defence, 176-7.
- Paekakariki: early road over hill, 3; improvements (*illus.*), 112; military camps, 174; (*illus.*), 174.
- Palmerston North: railway deviation (*illus.*), 103; aerodrome, 148; headquarters housing division district, 182; railway deviation, 263.
- Papakura: camp erected on cost-plus basis, f.n. 168; Ardmore Air Force station, 176.
- Papatupu: Rochfort held up, 55, 307; location, f.n. 55; further meeting, 309.
- Paremata: opposition to motorway, f.n. 251.
- Parikawa: change of name, 86.
- Parikino: Rochfort's trip, 308.
- Parliament Buildings: early view (*illus.*), 33; competition, 95; "Beehive", 228.
- "Parliamentary Special": stories, 81-2.
- Pastoral Workers Union: changed name, 104.
- Patea: route of railway, 47.
- Patutokotoko: Maori tribe, 310.
- Permanent Heads: of department, 302.
- Picton-Blenheim railway: proposed, f.n. 13; Brogden contract, f.n. 19.
- Pigeons: use for communications, f.n. 59.
- Piopiotea: on Rochfort's survey, 310; valley below spiral, 312-4.

Pipiriki: on supply route to N.I.M.T. railway, 80; Rochfort's trip, 308-9.
 Pirinoa: edge of civilisation, 53.
 Piripaua power scheme: construction, f.n. 162; completed, 191, 265.
 Planning: determining priorities, 108; capacity limited, 114; responsibility for, 188-9, 203; computer assists, 255; population estimates, committees, 272.
 Planning, town and country: administration transferred, 189; staff shortages, 206-7; departments functions, 253; story, 271-2.
 Plans: headings and showing scales, 31.
 Plant: steam shovel (*illus.*), 94; sent overseas, 165, 175; shortages, 204; alternatives to obtain, 212.
 Police station: early (*illus.*), 53.
 Political influence: effect on decisions, 48.
 Porirua: extensive housing development, 219-20; criticism, studies, 221.
 Post Offices: (*illus.*), Invercargill, 32; Wellington, 57; Wanganui, 92; Ashburton, 92; Auckland, 95; headquarters, Wellington, 224.
 Power: hydro, *see* hydro-electric; thermal *see* thermal; geothermal *see* geothermal.
 Power Division: established, 265.
 Power Planning Committee: recommendation, 238-40.
 Power Stations: location of, 299-300.
 Prefabrication: for military camps, 174.
 Prison labour: use on buildings, f.n. 59.
 Programming: works, 270.
 Progress: reference 69 (p. 61).
 Provinces: government, 3; relations with Central Government, abolition, 13.
 Public Buildings: *see* Buildings, Public.
 Public Relations: need for, 255; organised, 256.
 Public Service Commission *see* State Services Commission.
 Public Works Department: establishment, 8; organisation, growth of staff, 9; immigration separated, f.n. 10; functions, 13, 262-78; activities, 13-4; used for political ends, 16-7; peace keeping potential, 29; increase in activities 1876, 36; division of control, 39; difficulties arise, head office retained, 41; united again, 43; senior positions, 43-4; economic depression, 44-5; criticised by Commission, 46; intrusion of politics, 48; salary cuts, f.n. 50; threatened abolition, 51, 63; achievements, 52;

activities, 59; review of position, 60; staff reductions, 63-4; reprieve, 64-5; non-technical Minister, 66; separation senior positions, 66-7; again combined, 67; professional engineer as head, 68; expansion, 68-9; ordered to give up railway construction, 70; difficulties listed, f.n. 70; co-operative contracts, 71; construction agency, 75; staff recruitment, university training, 96; labour shortages, conditions, 101; workers agreement, 106-7; planning, 108; consultant to Main Highways Board, 113; traffic control, 113-4; hydro-electric functions, 115; criticisms, 120, 124-5; relief basis, 123; wage reductions, 124; P.W. Statement extravagant, f.n. 124; business men to advise, 125; activities during depression, relief agency, 126; political pressure, 130; new programme, 136; works reclassified, 137; new union agreement, 138; work for Housing Department, 163-4; effects of war, 164-5; men and equipment for overseas, 165; relationship to Ministry of Works, 179; new activities, reorganisation, 180; details, 181-8; new districts, 182-4; district officers, 183-4; numbers of engineers, 189-90; staff shortages, 190; combined with Ministry of Works, 196; aerial top-dressing, 196-7; review, 197-9; functions, 262-78; construction activities, operation and maintenance, 267; early personalities, 279; expenditure, 294-7; organisation charts, 286-293; railway mileages completed, 298; Ministers of Public Works, 301; heads of department, 302; engineering, 303; administration, 304; architects, 305; hydro-electric branch, 305; workers agreement, 316-7; rates of pay, 316; horse hire, 317.
 Pukekohe: relief camp at Aka Aka, 129.
 Purakanui: railway construction (*illus.*), 18.
 Putaruru: railway to Kinleith, 263.

Raglan: Maori offer to make road, 30.
 Railways: early operation, 4, 263; gauges, f.n. 5; construction (*illus.*), 18, 58, 83-5, 94, 102-3; reports required, Brogden contracts, 19; staffing, 23; information for British government, f.n. 31; peak construction in 1875, 33; operation in 1876, 36; committees and commissions, 36-9; staffing diffi-

culties, recommendations 1877 committee, 37; Commissioners appointed each island, 37, 263; separate department established, 37-8; transition difficulties, 38-9; bus competition, f.n. 37; for political ends, uneconomic, 47; some re-started, 136-7; construction era ended, 137; some construction retained, f.n. 162; decline of construction, lines opened, 192; mileages completed, 298.

Railways Department: established, commissioners appointed each island, 37, 263; transition difficulties, 38-9; methods of control, f.n. 39; to take over construction, 70, 263; Blow appointed under-secretary, 282.

Rakaia Bridge: Commission report, 13.
 Ranana: meeting with Maoris, 55; description, 308-9.

Rangataua Block: arguments, 306.

Rangitaiki River: power scheme, 265.

Rangitata River: irrigation (*illus.*), 151; supplies irrigation schemes, 152.

Rates: of pay, 316; horse hire, 317.

Raurimu: camps (*illus.*), 76, 85; spiral, 312-5; (*diagram*), 313; (*illus.*), 313-5.

Recreation halls: provision, 107, 138; text in agreement, 317.

Redcliffs: irrigation intake (*illus.*), 150.

Reform party: promised railways, 80.

Relief camps: *see* unemployment relief camps.

Reorganisation: committee to review, much debate, 180; major features, 181; new districts, 182; architects, 183; district officers, effective date, opposition to changes, 183-5; chief accountant's views, 185-6; Commissioner of Works assumes control, then becomes permanent head, 188; amalgamation, 196.

Repia Valley: part alternative N.I.M.T. route, 54.

Representation: on bodies, 276-7.

Resident Minister for the Middle Island: portfolio created, 11-2.

Retrenchment: warnings, 49-50; salary cuts, f.n. 50; abolish the department, 51-2; reprieve, 63-6.

Rimutaka: early road over, 3; Summit contract, f.n. 23; railway deviation, 192, 263; railway tunnel, 214-6.

Rivers control: reporting on, 87; organisation, 252-3; story, 273-4.

Roading: early conditions, 2-4; metalling, 5; strategic, 6; early actions, 14; construction (*illus.*), 18, 25, 58, 89, 110-2, 153-9; pioneer conditions (*illus.*), 58, 88, 112; important activity, taken from department, 86; traction

- engines, responsibilities, floods, 87; changes, Main Highways Board, 109-10; state highways, 153; effect of war, 192; backlog of work, 204; staff shortages, 207; contracts, 210; expenditure over periods, 217; National Roads Board, 228-30; Division formed, 229; deterioration, 230; heavy loading, 231; sealing, 233; location, 234; complex undertaking, 236; design, 252; story of development, 263-4.
- Roads Department: story, 264; chief clerk, 285.
- Rodney: poor roads, 4.
- Rongotai airport: *see under* Wellington.
- Rotoaira: Rochfort saw chiefs, 55, 310.
- Rotorua: negotiations re road to, 26-9; bath house, 95; railway to Taupo, 137; Lake high school (*illus.*), 222; forest research station, 266.
- Roxburgh power development: in hand, 192; men short, 205; contract, difficulties, 213; continued, 238; completion, 265.
- Royal New Zealand Air Force: war requirements, 152; Ardmore taken over, 176; aerial topdressing, 197.
- Royal visits: works, 267.
- Ruakaka: Rochfort held up, 55, 307; location, f.n. 55.
- Russia: war scare, 59.
- Scales: to be shown on plans, 31.
- Scientific and Industrial Research, Department of: grew grass on billiard ball, 152.
- Separate control: of North and of South Islands, 39-43.
- Servicemen, returned: placement of, 101.
- Services: difficulties with armed, 167; unnecessary duplication, 256; technical and advisory, 257, 278.
- Seventy-Mile Bush: on east-west road, f.n. 29.
- Shipping: delays, 22.
- Southland: station at, 48.
- Shovels, mechanical: at Cass (*illus.*), 94; at Palmerston North (*illus.*), 103; caterpillar (*illus.*), 147.
- Sluicing: hydraulic, 22.
- Snowy Mountains: staff loss to, 212.
- Soil Conservation and Rivers Control: Act, Council, 162; staff, 163; long standing, f.n. 163; aerial topdressing, 197; difficulties, 252; reorganisation, 253; story, 273-4.
- South Island Main Trunk Railway: opened, significance, 192; tunnel sections, 194.
- Southland: early railway, 4, f.n. 5; part of Otago district, 182.
- Staff: shortages, 23, 165, 171, 184, 189; number overseas, 171; comparative figures, 189-90; shortages in various categories, 205-8; loss to Australia, 208, 212; variations, 216.
- Standardisation: for military camps, 174.
- State Advances Corporation: housing part of, 163; influence on housing design, 219.
- State Highways: beginnings, 153.
- State Services Commission: concern with reorganisation, 180; suggested adjustments, 186; hampering effect, employment professional staff, 208.
- Stations, railway: naming of, 86.
- Steel: shortages, 204.
- Stores: complex procedure, f.n. 37; story, 274-5.
- Stratford: alternative N.I.M.T. route, 54; conditions on railway, 101; to Okahakura railway, 123.
- Supervision: of Maoris, 26.
- Surrey Hills: siphon (*illus.*), 151.
- Survey Department: chief clerk, 284.
- Surveys: methods, 21; prices, f.n. 21; unnecessary, 47; camps (*illus.*), 104, 105, 156. aerial, 234-5.
- Suvarov Island: adventures of survey party, 177.
- Tamaki: housing, 219, 221.
- Tangiwai: end of deviation, 81; memorial, 267.
- Tanks, military: conversion of tractors, 172-3; (*illus.*), 172.
- Taranaki: road construction (*illus.*), 18, 89; railway construction (*illus.*), 83, 102; sealed roads, toll gates, 110; to Main Trunk railway, 123.
- Tarawera: description of eruption, 57.
- Taumarunui: Rochfort held up, 55, 310; part Waikato district, 182.
- Taupo: centre of North Island road system, 29; p. & t. office, 55; Rochfort west of, 55, 310.
- Tauranga: negotiations re Rotorua road, 26-9; road to Taupo, f.n. 29; part Waikato district, 182; harbour facilities, 211; log transport, 233.
- Tauranga westwards railway: *see* East Coast Main Trunk Railway.
- Tawa railway deviation: continued, 123.
- Te Anau-Milford Sound Road: *see* Milford Sound Road.
- Te Awamutu: northern terminus N.I.M.T., 52; p. & t. office, 55.
- Technical: services, 278.
- Tekapo: *see* Lake Tekapo.
- Telegraph: use of, 14-5; connection of railway stations, 37; offices, 55.
- Telephone: beginnings, 55; exchanges, 266.
- Tenders Board: established, 80; war-time role, 168.
- Temperature: gradients, 235-6.
- Temuka workshops: armoured tractors, 172.
- Tents: basis of issue, 76-7; text in agreement, 317.
- Te Papa: Rochfort fired on, 55, 309; location, f.n. 55.
- Te Uira: Hursthouse held up, 52.
- Thames: snags in river, f.n. 50.
- Thames valley railway: construction, 48.
- Thermal Power: initiate use, 238. investigations, 242; New Plymouth (*illus.*), 251; locations, 299-300.
- Timaru: railway to Temuka, f.n. 13.
- Toanui: viaduct costs, 79.
- Tokaanu: Rochfort saw chiefs, 55, 310; passed through, 310.
- Tongariro power development: investigation, 238; peak loads, 240; approved in principle, 241; opposition, 248-9; aqueduct (*illus.*), 248; effect on fishing, 252; under construction, 265.
- Town and Country Planning: *see under* Planning.
- Traction engine: for transport, 87; driving crusher (*illus.*), 89.
- Traffic Control: by Public Works Department, 113, 271.
- Tramways: supervision of, 93; bush (*illus.*), 103; inspection of, 270.
- Travel Digest: references 151, 162 (p. 261).
- Tunnels: Lyttelton portal (*illus.*), 5; Arthurs Pass, 83-5; conditions during construction, f.n. 85; gang (*illus.*), 85; Homer (*illus.*), 157; Turakina-Fordell, 193-6; shape, 193-4; American section, 193. overseas contractors Rimutaka, 214-6; Swedish method, 215; Lyttelton Christchurch (*illus.*), 246.
- Turakina railway deviation: early surveys, problems, 192-3; tunnel sections, 193-4; defects, 194; tunnels pierced, 195; commission of enquiry, review, 195.
- Turangare: first opposition, 54, 306.
- Unemployment Board: established, 126; single men's camps, 126; rates of pay, 129.

Unemployment relief: new activity, wage rates and expenditure, 59; co-op. contracts, wage rates 73; early twenties, 107; foretaste of depression, 118; activities, schemes, camps, 126-130; unfit men, 130; agency, 135, 268-9; abolished, 137.

Unemployment relief camps: start of, 126; single mens camps, 126-130; Akatarawa, 129; Aka Aka near Pukekohe, 129.

Union: early, 78; formation of Workers, 104; 1920 agreement, 106; new agreement 1936; compulsory unionism, 138; no stopwork meetings, 142.

United States forces: arriving, 165; camps for, 174; extensions at Nandi, 175; aerodrome extension and base Ardmore, 176.

University Buildings: (*illus.*), Canterbury, 225-6; Auckland, 227.

University training: for engineers, 96; reinstated, f.n. 97.

Upokongaro: Kemp's headquarters, 54, 306; Rochfort 2nd visit, 308.

Ure River: origin of name Wharanui, 86.

Urenui: A. C. work not defective, 26.

Viaducts: costs, 79-80; (*illus.*), Makohine, 79; Mohaka, 139; Waiau, 193; Newmarket, 235; Wellington motorway, 237.

Waiau River (Hawkes Bay): viaduct (*illus.*), 193.

Waiau River (Southland): ferry (*illus.*), 94.

Waihi: Rochfort saw chiefs, 55, 310.

Waihou River: control works, 87, 273.

Waikaremoana: *see* Lake Waikaremoana.

Waikato: new district, 182; architects under Auckland, 183.

Waikato River: part alternative N.I.M.T. route, 54; hydro investigations, f.n. 162; Mangakino, 190; Karapiro (*illus.*), 191; to complete development, 238; hydro development completed, 241; diversion at Whakamaru, 241-2; rail bridge Hamilton, 263; Authority, 274.

Waimakariri Gorge: bridge (*illus.*), 49.

Waimarino: Rochfort's survey, 55, 307, 309; start of descent, 312.

Waimea: water race, f.n. 22.

Waiouru: end of deviation, 81.

Waipapa power scheme: investigations, 192; completion, 265.

Waipapakauri: aerial seeding, 196.

Wairakei power development: peak loads, 240; drilling (*illus.*), 242-3; output, 243; completion, 265.

Waitaki power development: cofferdam (*illus.*), 122; powerhouse and dam (*illus.*), 123; work continues, 123, 146; equipment dumped, f.n. 146; additional generators, f.n. 162, 191; Benmore, in hand, 238; completion, 265; Aviemore completed, upper under construction, 265.

Wanganui: p. & t. office, 55, (*illus.*), 92; on supply route, 80; part Wellington district, 182; new district, 184.

Wanganui River: supply route, 80; willow clearing, 273; Rochfort's description, 308-10.

War: Maori, 6; effects 1917-20, 93; staff overseas, 101; aerodromes branch, 152; effect on department, 162; expenditure, calls on personnel, 165; arrangements for construction, 165-72; master schedule, 169-71; staff shortages, 171-2; army "tanks", 172-3; role of department, 269.

Warkworth: satellite earth station, 278.

Watarupurupu: scene of fight, 310.

Water: conservation, 252-3; story, 273-4.

Water and Soil Conservation Division: established, 253; story, 273-4.

Water power: *see* Hydro-electric.

Water races: early investigations, 14; for gold mining, 22.

Wellington: exit routes, 2; railways north, f.n. 14; Government Buildings (*illus.*), 32, 57, 131; Parliament Buildings (*illus.*), 33; Supreme Court (*illus.*), 51; telephone exchange, 55; Government Printing Office (*illus.*), 56; early route to Auckland, f.n. 57; Lambton Quay, Post Office (*illus.*), 57; Parliament Buildings, Government House, 95; Public Trust Building (*illus.*), 96; headquarters of district, 182-3; changes made, 184; multi-storey flats, 219; Gordon Wilson flats (*illus.*), 220; postal headquarters (*illus.*), 224; Broadcasting House, 226; Government Printing Office, 226, 266; the "Beehive", Government Centre, 228; motorway (*illus.*), 232, 237; motorway affects housing, 236; airport, 254-5, (*illus.*), 254; Meteorological Office, 266; Old St. Pauls, 267.

Wellington-Wairarapa railway: early proposal, f.n. 14; Brogden contract, f.n. 19; Rochfort survey, f.n. 21; Summit contract, f.n. 23.

West Coast: early roading, 4; road to Nelson, 57; Workers Union, 77; link with Otago, 160; resources survey, 272.

West Coast Railway, from Christchurch: *see* Midland Railway and Midland Railway Company.

Westport: harbour works, f.n. 64; start of railway (*illus.*), 85; aerodrome 130; rail connection, 192.

Wet place: definition, f.n. 106; text in agreement, 316.

Whakamaru power scheme: investigations, f.n. 162; in hand, 191; river diversion, 241-2; completion, 265.

Whakapapa Valley: surveys, 314.

Whangarei: part Auckland district, 182; opposition to change, 184.

Wharanui: name change, 86.

Wharerata: road sealing (*illus.*), 112.

Whenuapai: bulldozers in action, 148-9; concreting of runways, 176.

Wigram: aerodrome at, 130.

Wiring: regulations, 264-5.

Worker(s): participation, 74; temporary or permanent, 118; wage reductions, 124; improved relations, 137; new men on works, 142; 1921 agreement, 316-7.

Workers accommodation: *see* accommodation.

Workers Union: *see* New Zealand Workers Union.

Works: reports required, 19; estimating, 21; programming, 270; Cabinet committee, 275.

TEXT: 12/13 pt Baskerville, Monophoto

PAPER: Kinleith "65" White Offset 102 gsm

